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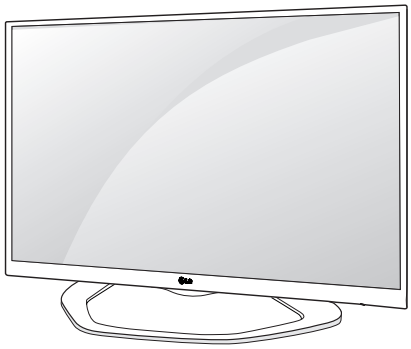
# LED TV
# SERVICE MANUAL

**CHASSIS : LD33B**

## MODEL : 42LA62** 42LA62**-Z*

**CAUTION**
BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



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# SAFETY PRECAUTIONS

## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and Exploded View.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

### General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

**Before returning the receiver to the customer,**

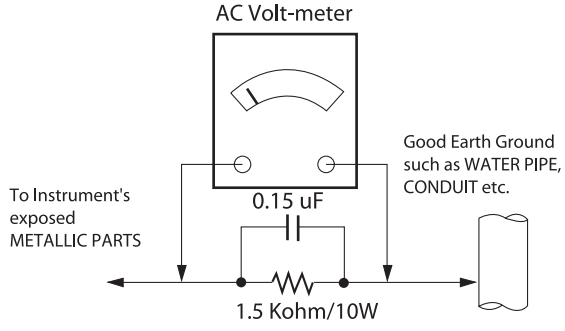
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

**Leakage Current Cold Check(Antenna Cold Check)**
With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.
If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 MΩ and 5.2 MΩ.
When the exposed metal has no return path to the chassis the reading must be infinite.
An other abnormality exists that must be corrected before the receiver is returned to the customer.

**Leakage Current Hot Check** (See below Figure)
Plug the AC cord directly into the AC outlet.

**Do not use a line Isolation Transformer during this check.**
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.
Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.
Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5 mA.
In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

**Leakage Current Hot Check circuit**




When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω
*Base on Adjustment standard

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# SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication.
*NOTE*: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   **CAUTION**: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
   **CAUTION**: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. Use with this receiver only the test fixtures specified in this service manual.
   **CAUTION**: Do not connect the test fixture ground strap to any heat sink in this receiver.

**Electrostatically Sensitive (ES) Devices**

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor “chip” components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as “anti-static” can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   **CAUTION**: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500 °F to 600 °F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   **CAUTION**: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

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**IC Remove/Replacement**
Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

*Removal*
1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

*Replacement*
1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

**"Small-Signal" Discrete Transistor Removal/Replacement**
1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device
Removal/Replacement
1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement
1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor
Removal/Replacement
1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

**Circuit Board Foil Repair**
Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

*At IC Connections*
To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

*At Other Connections*
Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.
   **CAUTION**: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

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# SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

## 1. Application range

This specification is applied to the LED TV used LD33B chassis.

## 2. Requirement for Test

Each part is tested as below without special appointment.

1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
2) Relative Humidity: 65 % ± 10 %
3) Power Voltage
   : Standard input voltage (AC 100-240 V~, 50/60 Hz)
   * Standard Voltage of each products is marked by models.
4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
5) The receiver must be operated for about 20 minutes prior to the adjustment.

## 3. Test method

1) Performance: LGE TV test method followed
2) Demanded other specification
   - Safety : CE, IEC specification
   - EMC : CE, IEC

## 4. Model General Specification

| No. | Item | Specification | Remarks |
|---|---|---|---|
| 1 | Market | EU(PAL Market-37Countries) | **DTV & Analog (Total 37 countries)**<br>**DTV (MPEG2/4, DVB-T) : 29 countries**<br>Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus<br><br>**DTV (MPEG2/4, DVB-T2): 8 countries**<br>UK(Ireland), Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan, Russia<br><br>**DTV (MPEG2/4, DVB-C): 37 countries**<br>Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan<br><br>**DTV (MPEG2/4,DVB-S): 30 countries**<br>Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus<br><br>**Supported satellite : 22 satellites**<br>HISPASAT 1C/1D, ATLANTIC BIRD 2, NILESAT 101/102, ATLANTIC BIRD 3, AMOS 2/3, THOR 5/6, IRIUS 4, EUTELSAT-W3A, EUROBIRD 9A, EUTELSAT-W2A, HOTBIRD 6/8/9, EUTELSAT-SESAT, ASTRA 1L/H/M/KR, ASTRA 3A/3B, BADR 4/6, ASTRA 2D, EUROBIRD 3, EUTELSAT-W7, HELLASSAT 2, EXPRESS AM1, TURKSAT 2A/3A, INTERSAT10 |

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| No. | Item | Specification | Remarks |
|---|---|---|---|
| 2 | Broadcasting system | 1) PAL-BG<br>2) PAL-DK<br>3) PAL-I/I'<br>4) SECAM-L/L', DK , BG, I<br>5) DVB-T<br>6) DVB-C<br>7) DVB-T2<br>8) DVB-S/S2 | Model : *L*V*-Z* (T2 only Model)<br><br>DVB-S: Satellite |
| 3 | Program coverage | 1 ) Digital TV<br>- VHF, UHF<br>- C-Band,Ku-Band<br>2) Analogue TV<br>- VHF : E2 to E12<br>- UHF : E21 to E69<br>- CATV : S1 to S20<br>- HYPER : S21 to S47 | |
| 4 | Receiving system | Analog : Upper Heterodyne<br>Digital : COFDM, QAM | ► DVB-T<br>- Guard Interval(Bitrate_Mbit/s)<br>1/4, 1/8, 1/16, 1/32<br>- Modulation : Code Rate<br>QPSK : 1/2, 2/3, 3/4, 5/6, 7/8<br>16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8<br>64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8<br><br>► DVB-T2 (Model : *L*V*-Z* (T2 only Model))<br>- Guard Interval(Bitrate_Mbit/s)<br>1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256,<br>- Modulation : Code Rate<br>QPSK : 1/2, 2/5, 2/3, 3/4, 5/6<br>16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6<br>64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6<br>256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6<br><br>► DVB-C<br>- Symbolrate : 4.0Msymbols/s to 7.2Msymbols/s<br>- Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM<br><br>► DVB-S/S2<br>- symbolrate<br>DVB-S2 (8PSK / QPSK) : 2 ~ 45Msymbol/s<br>DVB-S (QPSK) : 2 ~ 45Msymbol/s<br>- viterbi<br>DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8<br>DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10 |
| 5 | Scart (1EA) | PAL, SECAM | Scart 1 Jack is Full scart and support ATV/DTV-OUT<br>(not support DTV Auto AV) |
| 6 | Video Input RCA(1EA) | PAL, SECAM, NTSC | 4 System : PAL, SECAM, NTSC, PAL60<br>Common port |
| 7 | Head phone out | Antenna, AV1, AV2, Component, HDMI1, HDMI2, HDMI3, USB1, USB2, USB3 | |
| 8 | Component Input (1EA) | Y/Cb/Cr<br>Y/Pb/Pr | Hybrid Type |
| 9 | HDMI Input (3EA) | HDMI1-DTV<br>HDMI2-DTV<br>HDMI3-DTV | HDMI1: PC support(HDMI version 1.3)<br>Support HDCP |
| 10 | Audio Input (3EA) | DVI Audio<br>Component/AV2<br>AV1 | L/R Input. |
| 11 | SDPIF out (1EA) | SPDIF out | |
| 12 | USB (1EA) | EMF, DivX HD, For SVC (download) | JPEG, MP3, DivX HD |
| 13 | Ethernet Connect(1EA) | Ethernet Connect | |

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## 5. Component Video Input (Y, $P_B$, $P_R$)

| No. | Resolution | H-freq(kHz) | V-freq(Hz) | Pixel clock |
|---|---|---|---|---|
| 1. | 720×480 | 15.73 | 60.00 | SDTV, DVD 480i |
| 2. | 720×480 | 15.63 | 59.94 | SDTV, DVD 480i |
| 3. | 720×480 | 31.47 | 59.94 | 480p |
| 4. | 720×480 | 31.50 | 60.00 | 480p |
| 5. | 720×576 | 15.625 | 50.00 | SDTV 576i |
| 6. | 720×576 | 31.25 | 50.00 | SDTV 576p |
| 7. | 1280×720 | 45.00 | 50.00 | HDTV 720p |
| 8. | 1280×720 | 44.96 | 59.94 | HDTV 720p |
| 9. | 1280×720 | 45.00 | 60.00 | HDTV 720p |
| 10. | 1920×1080 | 31.25 | 50.00 | HDTV 1080i |
| 11. | 1920×1080 | 33.75 | 60.00 | HDTV 1080i |
| 12. | 1920×1080 | 33.72 | 59.94 | HDTV 1080i |
| 13. | 1920×1080 | 56.250 | 50 | HDTV 1080p |
| 14. | 1920×1080 | 67.5 | 60 | HDTV 1080p |

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# 6. HDMI Input

## 6.1. DTV mode

| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock(MHz) |
|---|---|---|---|---|
| 1. | 640*480 | 31.469 / 31.5 | 59.94/60 | SDTV 480P |
| 2. | 720*480 | 31.469 / 31.5 | 59.94 / 60 | SDTV 480P |
| 3. | 720*576 | 31.25 | 50 | SDTV 576P |
| 4. | 720*576 | 15.625 | 50 | SDTV 576I |
| 5. | 1280*720 | 37.500 | 50 | HDTV 720P |
| 6. | 1280*720 | 44.96 / 45 | 59.94 / 60 | HDTV 720P |
| 7. | 1920*1080 | 33.72 / 33.75 | 59.94 / 60 | HDTV 1080I |
| 8. | 1920*1080 | 28.125 | 50.00 | HDTV 1080I |
| 9. | 1920*1080 | 26.97 / 27 | 23.97 / 24 | HDTV 1080P |
| 10. | 1920*1080 | | 25 | HDTV 1080P |
| 11. | 1920*1080 | 33.716 / 33.75 | 29.976 / 30.00 | HDTV 1080P |
| 12. | 1920*1080 | 56.250 | 50 | HDTV 1080P |
| 13. | 1920*1080 | 67.43 / 67.5 | 59.94 / 60 | HDTV 1080P |

## 6.2. PC mode

| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock(MHz) |
|---|---|---|---|---|
| 1 | 640 x 350 @70Hz | 31.468 | 70.09 | EGA |
| 2 | 720 x 400 @70Hz | 31.469 | 70.08 | DOS |
| 3 | 640 x 480 @60Hz | 31.469 | 59.94 | VESA(VGA) |
| 4 | 800 x 600 @60Hz | 37.879 | 60.31 | VESA(SVGA) |
| 5 | 1024 x 768 @60Hz | 48.363 | 60.00 | VESA(XGA) |
| 6 | 1152 x 864 @60Hz | 54.348 | 60.053 | VESA |
| 7 | 1280 x 1024 @60Hz | 63.981 | 60.020 | VESA(SXGA) |
| 8 | 1360 x 768 @60Hz | 47.712 | 60.015 | VESA(WXGA) |
| 9 | 1920 x 1080 @60Hz | 67.5 | 60.00 | WUXGA(Reduced Blanking) |
| 10. | 1920*1080 | | 25 | HDTV 1080P |
| 11. | 1920*1080 | 33.716 / 33.75 | 29.976 / 30.00 | HDTV 1080P |
| 12. | 1920*1080 | 56.250 | 50 | HDTV 1080P |
| 13. | 1920*1080 | 67.43 / 67.5 | 59.94 / 60 | HDTV 1080P |

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# 7. 3D Mode

## 7.1. HDMI 1.4b (3D supported mode automatically)

| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock(MHz) | VIC | 3D input proposed mode | Proposed |
|---|---|---|---|---|---|---|---|
| 1 | 640*480 | 31.469 / 31.5 | 59.94/ 60 | 25.125 | 1 | Top-and-Bottom<br>Side-by-side(half) | Secondary(SDTV 480P)<br>Secondary(SDTV 480P) |
| 2 | | 62.938/63 | 59.94/ 60 | 50.35/50.4 | 1 | Frame packing<br>Line alternative | Secondary(SDTV 480P)<br>(SDTV 480P) |
| 3 | | 31.469 / 31.5 | 59.94/ 60 | 50.35/50.4 | 1 | Side-by-side(Full) | (SDTV 480P) |
| 4 | 720*480 | 31.469 / 31.5 | 59.94 / 60 | 27.00/27.03 | 2,3 | Top-and-Bottom<br>Side-by-side(half) | Secondary(SDTV 480P)<br>Secondary(SDTV 480P) |
| 5 | | 62.938/63 | 59.94 / 60 | 54/54.06 | 2,3 | Frame packing<br>Line alternative | Secondary(SDTV 480P)<br>(SDTV 480P) |
| 6 | | 31.469 / 31.5 | 59.94 / 60 | 54/54.06 | 2,3 | Side-by-side(Full) | (SDTV 480P) |
| 7 | 720*576 | 31.25 | 50 | 27 | 17,18 | Top-and-Bottom<br>Side-by-side(half) | Secondary(SDTV 576P)<br>Secondary(SDTV 576P) |
| 8 | | 62.5 | 50 | 54 | 17,18 | Frame packing<br>Line alternative | Secondary(SDTV 576P)<br>(SDTV 576P) |
| 9 | | 31.25 | 50 | 54 | 17,18 | Side-by-side(Full) | (SDTV 576P) |
| 10 | 720*576 | 15.625 | 50 | 27 | 21 | Top-and-Bottom<br>Side-by-side(half) | Secondary(SDTV 576I)<br>Secondary(SDTV 576I) |
| 11 | | 31.25 | 50 | 54 | 21 | Frame packing<br>Field alternative | Secondary(SDTV 576I)<br>(SDTV 576I) |
| 12 | | 15.625 | 50 | 54 | 21 | Side-by-side(Full) | (SDTV 576I) |
| 13 | 1280*720 | 37.500 | 50 | 74.25 | 19 | Top-and-Bottom<br>Side-by-side(half) | Primary(HDTV 720P)<br>Primary(HDTV 720P) |
| 14 | | 75 | 50 | 148.5 | 19 | Frame packing<br>Line alternative | Primary(HDTV 720P)<br>(HDTV 720P) |
| 15 | | 37.500 | 50 | 148.5 | 19 | Side-by-side(Full) | (HDTV 720P) |
| 16 | | 44.96 / 45 | 59.94 / 60 | 74.18/74.25 | 4 | Top-and-Bottom<br>Side-by-side(half) | Primary(HDTV 720P)<br>Primary(HDTV 720P) |
| 17 | | 89.91/90 | 59.94 / 60 | 148.35/148.5 | 4 | Frame packing<br>Line alternative | Primary(HDTV 720P)<br>(HDTV 720P) |
| 18 | | 44.96 / 45 | 59.94 / 60 | 148.35/148.5 | 4 | Side-by-side(Full) | (HDTV 720P) |
| 19 | 1920*1080 | 33.72 / 33.75 | 59.94 / 60 | 74.18/74.25 | 5 | Top-and-Bottom<br>Side-by-side(half) | Secondary(HDTV 1080I)<br>Primary(HDTV 1080I) |
| 20 | | 67.432 / 67.50 | 59.94 / 60 | 148.35/148.5 | 5 | Frame packing<br>Field alternative | Primary(HDTV 1080I)<br>(HDTV 1080I) |
| 21 | | 33.72 / 33.75 | 59.94 / 60 | 148.35/148.5 | 5 | Side-by-side(Full) | (HDTV 1080I) |
| 22 | | 28.125 | 50.00 | 74.25 | 20 | Top-and-Bottom<br>Side-by-side(half) | Secondary(HDTV 1080I)<br>Primary(HDTV 1080I) |
| 23 | | 56.25 | 50.00 | 148.5 | 20 | Frame packing<br>Field alternative | Primary(HDTV 1080I)<br>(HDTV 1080I) |
| 24 | | 28.125 | 50.00 | 148.5 | 20 | Side-by-side(Full) | (HDTV 1080I) |
| 25 | 1920*1080 | 26.97 / 27 | 23.97 / 24 | 74.18/74.25 | 32 | Top-and-Bottom<br>Side-by-side(half) | Primary(HDTV 1080P)<br>Primary(HDTV 1080P) |
| 26 | | 43.94/54 | 23.97 / 24 | 148.35/148.5 | 32 | Frame packing<br>Line alternative | Primary(HDTV 1080P)<br>(HDTV 1080P) |
| 27 | | 26.97 / 27 | 23.97 / 24 | 148.35/148.5 | 32 | Side-by-side(Full) | (HDTV 1080P) |
| 28 | | 28.125 | 25 | 74.25 | 33 | Top-and-Bottom<br>Side-by-side(half) | Secondary(HDTV 1080P)<br>Secondary(HDTV 1080P) |
| 29 | | 56.24 | 25 | 148.5 | 33 | Frame packing<br>Line alternative | Secondary(HDTV 1080P)<br>(HDTV 1080P) |
| 30 | | 28.12 | 25 | 148.5 | 33 | Side-by-side(Full) | (HDTV 1080P) |
| 31 | | 33.716 / 33.75 | 29.976 / 30.00 | 74.18/74.25 | 34 | Top-and-Bottom<br>Side-by-side(half) | Primary(HDTV 1080P)<br>Secondary(HDTV 1080P) |
| 32 | | 67.432 / 67.5 | 29.976 / 30.00 | 148.35/148.5 | 34 | Frame packing<br>Line alternative | Primary(HDTV 1080P)<br>(HDTV 1080P) |
| 33 | | 33.716 / 33.75 | 29.976 / 30.00 | 148.35/148.5 | 34 | Side-by-side(Full) | (HDTV 1080P) |
| 34 | | 56.250 | 50 | 148.5 | 31 | Top-and-Bottom<br>Side-by-side(half) | Primary(HDTV 1080P)<br>Secondary(HDTV 1080P) |
| 35 | | 67.43 / 67.5 | 59.94 / 60 | 148.35/148.50 | 16 | Top-and-Bottom<br>Side-by-side(half) | Primary(HDTV 1080P)<br>Secondary(HDTV 1080P) |

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## 7.2. HDMI Input(1.3)

| No. | Resolution | H-freq(kHz) | V-freq.(kHz) | Pixel clock(MHz) | Proposed | 3D input proposed mode |
|---|---|---|---|---|---|---|
| 1 | 1280*720 | 45.00 | 60.00 | 74.25 | HDTV 720P | 2D to 3D, Side by Side(half), Top & Bottom, Single Frame Sequential |
| 2 | 1280*720 | 37.500 | 50 | 74.25 | HDTV 720P | |
| 3 | 1920*1080 | 33.75 | 60.00 | 74.25 | HDTV 1080I | 2D to 3D, Side by Side(half), Top & Bottom |
| 4 | 1920*1080 | 28.125 | 50.00 | 74.25 | HDTV 1080I | |
| 5 | 1920*1080 | 27.00 | 24.00 | 74.25 | HDTV 1080P | 2D to 3D, Side by Side(Half), Top & Bottom, Checker Board |
| 6 | 1920*1080 | 28.12 | 25 | 74.25 | HDTV 1080P | |
| 7 | 1920*1080 | 33.75 | 30.00 | 74.25 | HDTV 1080P | |
| 8 | 1920*1080 | 67.50 | 60.00 | 148.5 | HDTV 1080P | 2D to 3D, Side by Side(half), Top & Bottom, Checkerboard, Single Frame Sequential, Row Interleaving, Column Interleaving |
| 9 | 1920*1080 | 56.25 | 50 | 148.5 | HDTV 1080P | |

## 7.3. RF Input(3D supported mode manually)

| No. | Resolution | Proposed | 3D input proposed mode |
|---|---|---|---|
| 1 | HD | 1080I<br>720P | 2D to 3D<br>Side by Side(Half)<br>Top & Bottom |
| 2 | SD | 576P<br>576I | 2D to 3D |

## 7.4. RF Input (3D supported mode automatically)

| No. | Signal | 3D input proposed mode |
|---|---|---|
| 1 | Frame Compatible | Side by Side(Half),<br>Top & Bottom |

## 7.5. USB Input (3D supported mode manually)

| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock(MHz) | Proposed | 3D input proposed mode |
|---|---|---|---|---|---|---|
| 1 | 1920*1080 | 33.75 | 30 | 74.25 | HDTV 1080P | 2D to 3D, **Side by Side(Half)***, **Top & Bottom*, Checkerboard***, Row Interleaving, Column Interleaving (Photo : side by Side(half), Top & Bottom) |
| | Others | - | - | - | 640*350<br>720*400<br>640*480<br>800*600<br>1152*864<br>1280*1024 | 2D to 3D |

**("*" 3D supported mode manually & automatically)**

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## 7.6. HDMI-PC Input (3D supported mode manually)

| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock(MHz) | 3D input proposed mode | Proposed |
|---|---|---|---|---|---|---|
| 1 | 1024*768 | 48.36 | 60 | 65 | 2D to 3D, Side by Side(half)<br>Top & Bottom | HDTV 768P |
| 2 | 1360*768 | 47.71 | 60 | 85.5 | 2D to 3D, Side by Side(half)<br>Top & Bottom | HDTV 768P |
| 3 | 1920*1080 | 67.500 | 60 | 148.50 | 2D to 3D, Side by Side(half)<br>Top & Bottom, Checker Board,<br>Single Frame Sequential,<br>Row Interleaving,<br>Column Interleaving | HDTV 1080P |
| 4 | Others | - | - | - | 2D to 3D | 640*350<br>720*400<br>640*480<br>800*600<br>1152*864 |

## 7.7. DLNA Input (3D supported mode manually)

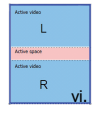
| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock(MHz) | Proposed | 3D input proposed mode |
|---|---|---|---|---|---|---|
| 1 | 1920*1080 | 33.75 | 30 | 74.25 | | 2D to 3D, **Side by Side(Half)*,Top & Bottom*,Checker Board***, Row Interleaving, Column Interleaving(Photo : Side by Side(Half), Top&Bottom) |

**(“*” 3D supported mode manually & automatically)**

## 7.8. Component Input(3D) (3D supported mode manually)

| No. | Resolution | H-freq(kHz) | V-freq.(Hz) | Pixel clock | Proposed | 3D input proposed mode |
|---|---|---|---|---|---|---|
| 1 | 1280*720 | 45.00 | 60.00 | 74.25 | HDTV 720P | 2D to 3D, Side by Side(Half), Top & Bottom |
| 2 | 1280*720 | 37.500 | 50 | 74.25 | HDTV 720P | |
| 3 | 1920*1080 | 33.75 | 60.00 | 74.25 | HDTV 1080I | |
| 4 | 1920*1080 | 28.125 | 50.00 | 74.25 | HDTV 1080I | |
| 5 | 1920*1080 | 27.00 | 24.00 | 74.25 | HDTV 1080P | |
| 6 | 1920*1080 | 28.12 | 25 | 74.25 | HDTV 1080P | |
| 7 | 1920*1080 | 33.75 | 30.00 | 74.25 | HDTV 1080P | |
| 8 | 1920*1080 | 67.50 | 60.00 | 148.5 | HDTV 1080P | |
| 9 | 1920*1080 | 56.250 | 50 | 148.5 | HDTV 1080P | |

## 7.9. 3D Input mode

| No. | Side by Side | Top & Bottom | Checker board | Single Frame Sequential | Frame Packing | 2D to 3D |
|---|---|---|---|---|---|---|
| 1 | | | | |  | |

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# ADJUSTMENT INSTRUCTION

## 1. Application Range

This specification sheet is applied to all of the LED TV with LD33B chassis.

## 2. Designation

(1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
(2) Adjustment must be done in the correct order.
(3) The adjustment must be performed in the circumstance of 25 °C ± 5 °C of temperature and 65 % ± 10 % of relative humidity if there is no specific designation.
(4) The input voltage of the receiver must keep AC 100-240 V~, 50/60 Hz.
(5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15.

In case of keeping module is in the circumstance of 0 °C, it should be placed in the circumstance of above 15 °C for 2 hours.

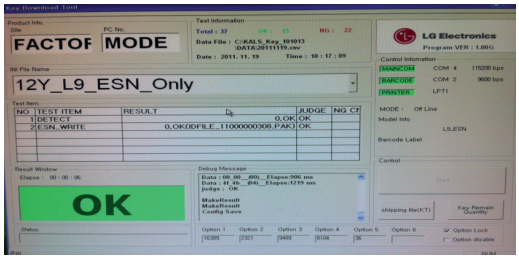
In case of keeping module is in the circumstance of below -20 °C, it should be placed in the circumstance of above 15 °C for 3 hours.

[Caution]
When still image is displayed for a period of 20 minutes or longer (Especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area.

## 3. Automatic Adjustment

### 3.1. MAC address D/L, CI+ key D/L, Widevine key D/L, ESN D/L, HDCP14/20 D/L

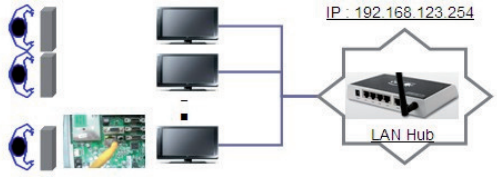
Connect: USB port
Communication Prot connection
- Com 1,2,3,4 and 115200(Baudrate)
  Mode check: Online Only
- Check the test process: DETECT -> MAC -> CI -> Widevine -> ESN -> HDCP14 -> HDCP20
- Play: Press Enter key
- Result: Ready, Test, OK or NG
- Printer Out (MAC Address Label)




### 3.2. LAN Inspection

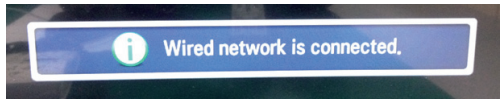
#### 3.2.1. Equipment & Condition

- Each other connection to LAN Port of IP Hub and Jig

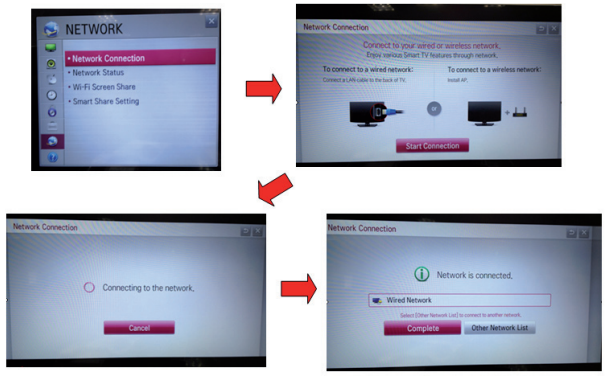



#### 3.2.2. LAN inspection solution

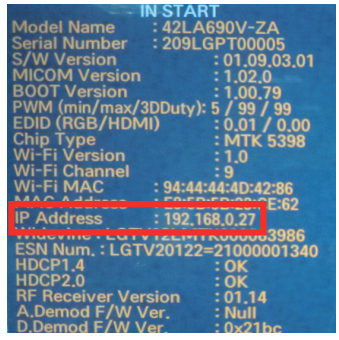
- LAN Port connection with PCB
- Setting automatic IP




- If you want manual connection, enter Network connection at MENU Mode of TV. Press Start connection key, then Network will be connected.




- Setting state confirmation
  - If automatic setting is finished, you confirm IP and MAC Address at 'in start' menu mode.


IN START
Model Name : 42LA690V-ZA
Serial Number : 209LGPT00005
S/W Version : 01.09.03.01
MICOM Version : 1.02.0
BOOT Version : 1.00.79
PWM (min/max/3DDuty): 5 / 99 / 99
EDID (RGB/HDMI) : 0.01 / 0.00
Chip Type : MTK 5398
Wi-Fi Version : 1.0
Wi-Fi Channel : 9
Wi-Fi MAC : 94:44:44:4D:42:86
IP Address : 192.168.0.27
ESN Num. : LGTV20122=21000001340
HDCP1.4 : OK
HDCP2.0 : OK
RF Receiver Version : 01.14
A.Demod F/W Ver. : Null

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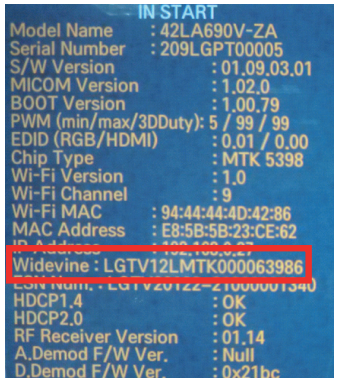
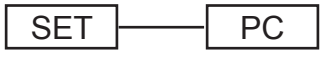
### 3.2.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.


IN START
Model Name : 42LA690V-ZA
Serial Number : 209LGPT00005
S/W Version : 01.09.03.01
MICOM Version : 1.02.0
BOOT Version : 1.00.79
PWM (min/max/3DDuty): 5 / 99 / 99
EDID (RGB/HDMI) : 0.01 / 0.00
Chip Type : MTK 5398
Wi-Fi Version : 1.0
Wi-Fi Channel : 9
Wi-Fi MAC : 94:44:44:4D:42:86
MAC Address : E8:5B:5B:23:CE:62
Widevine : LGTV12LMTK000063986
HDCP1.4 : OK
HDCP2.0 : OK
RF Receiver Version : 01.14
A.Demod F/W Ver. : Null

## 3.3. LAN PORT INSPECTION(PING TEST)

Connect SET → LAN port == PC → LAN Port

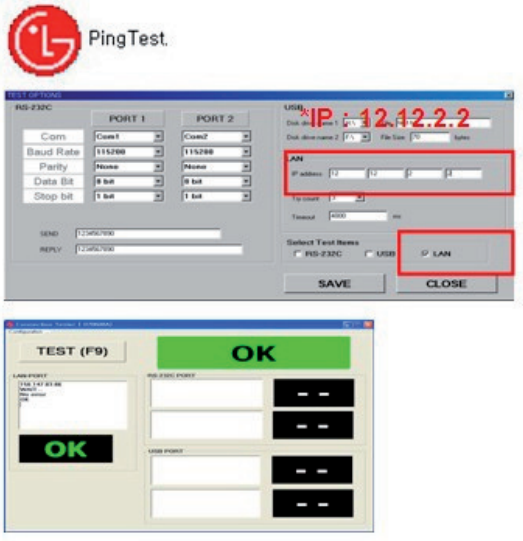



### 3.3.1. Equipment setting

(1) Play the LAN Port Test PROGRAM.
(2) Input IP set up for an inspection to Test Program.
*IP Number : 12.12.2.2

### 3.3.2. LAN PORT inspection(PING TEST)

(1) Play the LAN Port Test Program.
(2) Connect each other LAN Port Jack.
(3) Play Test (F9) button and confirm OK Message.
(4) Remove LAN cable.




## 3.4. Model name & Serial number Download

### 3.4.1. Model name & Serial number D/L

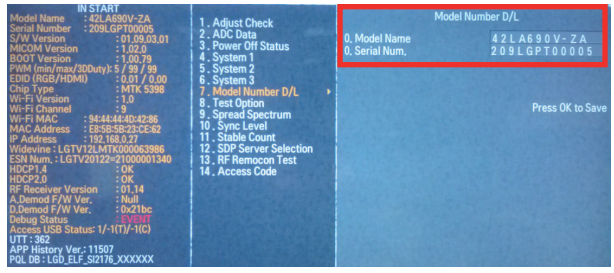
- Press "P-ONLY" key of service remote control. (Baud rate : 115200 bps)
- Connect RS-232C Signal to USB Cable to USB.
- Write Serial number by use USB port.
- Must check the serial number at Instart menu.

### 3.4.2. Method & notice

(1) Serial number D/L is using of scan equipment.
(2) Setting of scan equipment operated by Manufacturing Technology Group.
(3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

*** Manual Download (Model Name and Serial Number)**

If the TV set is downloaded by OTA or service man, sometimes model name or serial number is initialized.(Not always)
It is impossible to download by bar code scan, so It need Manual download.
1) Press the "Instart" key of Adjustment remote control.
2) Go to the menu "7.Model Number D/L" like below photo.
3) Input the Factory model name(ex 42LA690V-ZA) or Serial number like photo.




4) Check the model name Instart menu. → Factory name displayed. (ex 42LA690V-ZA)
5) Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 42LA690V-ZA)

## 3.5. CI+ Key checking method

- Check the Section 3.1

Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).

=> Check the Download to CI+ Key value in LGset.

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### 3.5.1. Check the method of CI+ Key value

(1) Check the method on Instart menu

(2) Check the method of RS232C Command

1) Into the main ass'y mode(RS232: aa 00 00)

| CMD 1 | CMD 2 | Data 0 | |
|---|---|---|---|
| A | A | 0 | 0 |

2) Check the key download for transmitted command (RS232: ci 00 10)

| CMD 1 | CMD 2 | Data 0 | |
|---|---|---|---|
| C | I | 1 | 0 |

3) Result value

- Normally status for download : OKx
- Abnormally status for download : NGx

### 3.5.2. Check the method of CI+ key value(RS232)

1) Into the main ass'y mode(RS232: aa 00 00)

| CMD 1 | CMD 2 | Data 0 | |
|---|---|---|---|
| A | A | 0 | 0 |

2) Check the mothed of CI+ key by command (RS232: ci 00 20)

| CMD 1 | CMD 2 | Data 0 | |
|---|---|---|---|
| C | I | 2 | 0 |

3) Result value

i 01 OK 1d1852d21c1ed5dcx

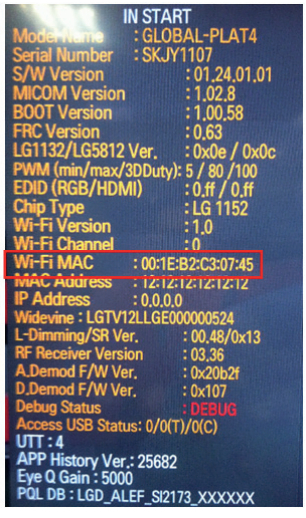
→ CI+ Key Value

## 3.6. WIFI MAC ADDRESS CHECK

(1) Using RS232 Command

| | H-freq(kHz) | V-freq.(Hz) |
|---|---|---|
| Transmission | [A][I][][Set ID][][20][Cr] | [O][K][X] or [NG] |

(2) Check the menu on in-start


IN START
Model Name : GLOBAL-PLAT4
Serial Number : SKJY1107
S/W Version : 01.24.01.01
MICOM Version : 1.02.8
BOOT Version : 1.00.58
FRC Version : 0.63
LG1132/LG5812 Ver. : 0x0e / 0x0c
PWM (min/max/3DDuty): 5 / 80 /100
EDID (RGB/HDMI) : 0.ff / 0.ff
Chip Type : LG 1152
Wi-Fi Version : 1.0
Wi-Fi Channel : 0
Wi-Fi MAC : 00:1E:B2:C3:07:45
MAC Address : 12:12:12:12:12:12
IP Address : 0.0.0.0
Widevine : LGTV12LLGE000000524
L-Dimming/SR Ver. : 00.48/0x13
RF Receiver Version : 03.36
A.Demod F/W Ver. : 0x20b2f
D.Demod F/W Ver. : 0x107
Debug Status : DEBUG
Access USB Status: 0/0(T)/0(C)
UTT : 4
APP History Ver.: 25682
Eye Q Gain : 5000
PQL DB : LGD_ALEF_SI2173_XXXXXX

# 4. Manual Adjustment

* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

## 4.1. EDID DATA

### 4.1.1. 3D EDID

HDMI_EDID DATA _3D

| | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 | 0x08 | 0x09 | 0x0A | 0x0B | 0x0C | 0x0D | 0x0E | 0x0F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x00 | 00 | FF | FF | FF | FF | FF | FF | 00 | 1E | 6D | ⓐ | | | | ⓑ | |
| 0x01 | ⓒ | | 01 | 03 | 80 | A0 | 5A | 78 | 0A | EE | 91 | A3 | 54 | 4C | 99 | 26 |
| 0x02 | 0F | 50 | 54 | A1 | 08 | 00 | 31 | 40 | 45 | 40 | 61 | 40 | 71 | 40 | 81 | 80 |
| 0x03 | 01 | 01 | 01 | 01 | 01 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 | 2C |
| 0x04 | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 66 | 21 | 50 | B0 | 51 | 00 | 1B | 30 |
| 0x05 | 40 | 70 | 36 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 00 | 00 | 00 | FD | 00 | 3A |
| 0x06 | 3E | 1E | 53 | 10 | 00 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | ⓓ | | | |
| 0x07 | ⓓ | | | | | | | | | | | | | | ⓔ1 | |
| 0x00 | 02 | 03 | 3A | F1 | 4E | 10 | 9F | 04 | 13 | 05 | 14 | 03 | 02 | 12 | 20 | 21 |
| 0x01 | 22 | 15 | 01 | 29 | 3D | 06 | C0 | 15 | 07 | 50 | 09 | 57 | 07 | ⓕ | | |
| 0x02 | ⓕ | | | | | | | | | | | | | | | |
| 0x03 | ⓕ | | | | | | ⓖ | | | | 02 | 3A | 80 | 18 | 71 | 38 |
| 0x04 | 2D | 40 | 58 | 2C | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 01 | 1D | 80 | 18 |
| 0x05 | 71 | 1C | 16 | 20 | 58 | 2C | 25 | 00 | 40 | 84 | 63 | 00 | 00 | 9E | 01 | 1D |
| 0x06 | 00 | 72 | 51 | D0 | 1E | 20 | 6E | 28 | 55 | 00 | 40 | 84 | 63 | 00 | 00 | 1E |
| 0x07 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ⓔ2 |

▪ Reference

- HDMI1 ~ HDMI4 / RGB
- In the data of EDID, bellows may be different by S/W or Input mode.

ⓐ Product ID

| HEX | EDID Table | DDC Function |
|---|---|---|
| 0001 | 0100 | Analog |
| 0001 | 0100 | Digital |

ⓑ Serial No: Controlled on production line.

ⓒ Month, Year: Controlled on production line:

ex) Monthly : '01' → '01'

Year : '2013' → '17'

ⓓ Model Name(Hex): LGTV

| Chassis | MODEL NAME(HEX) |
|---|---|
| LD33B | 00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20 |

ⓔ Checksum(LG TV): Changeable by total EDID data.

| | ⓔ1 | ⓔ2 10bit /none XvYcc | ⓔ2 8bit /none XvYcc | ⓔ3 |
|---|---|---|---|---|
| HDMI1 | E8 | 85 | CC | X |
| HDMI2 | E8 | 75 | BC | X |
| HDMI3 | E8 | 65 | AC | X |

ⓕ Vendor Specific(HDMI)

1) Deep color (module 10bit)

| INPUT | MODEL NAME(HEX) |
|---|---|
| HDMI1 | 78 03 0C 00 10 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10 |
| HDMI2 | 78 03 0C 00 20 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10 |
| HDMI3 | 78 03 0C 00 30 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10 |

2) None deep color (module 8bit)

| INPUT | MODEL NAME(HEX) |
|---|---|
| HDMI1 | 78 03 0C 00 10 00 80 1E 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10 |
| HDMI2 | 78 03 0C 00 20 00 80 1E 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10 |
| HDMI3 | 78 03 0C 00 30 00 80 1E 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10 |

ⓖ Colorimetry Data Block(HDMI)

1) The Model not supporting XvYcc

| INPUT | MODEL NAME(HEX) |
|---|---|
| HDMI1 | E3 05 00 00 |
| HDMI2 | E3 05 00 00 |
| HDMI3 | E3 05 00 00 |

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### 4.1.2. 2D EDID

HDMI_EDID DATA _2D

| | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 | 0x08 | 0x09 | 0x0A | 0x0B | 0x0C | 0x0D | 0x0E | 0x0F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x00 | 00 | FF | FF | FF | FF | FF | FF | 00 | 1E | 6D | ⓐ | | ⓑ | | | |
| 0x01 | ⓒ | | 01 | 03 | 80 | A0 | 5A | 78 | 0A | EE | 91 | A3 | 54 | 4C | 99 | 26 |
| 0x02 | 0F | 50 | 54 | A1 | 08 | 00 | 31 | 40 | 45 | 40 | 61 | 40 | 71 | 40 | 81 | 80 |
| 0x03 | 01 | 01 | 01 | 01 | 01 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 | 2C |
| 0x04 | 45 | 00 | A0 | 5A | 00 | 00 | 00 | 1E | 66 | 21 | 50 | B0 | 51 | 00 | 1B | 30 |
| 0x05 | 40 | 70 | 36 | 00 | A0 | 5A | 00 | 00 | 00 | 1E | 00 | 00 | 00 | FD | 00 | 3A |
| 0x06 | 3E | 1E | 53 | 10 | 00 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | ⓓ | | | |
| 0x07 | ⓓ | | | | | | | | | | | | | | 01 | ⓔ1 |
| 0x00 | 02 | 03 | 26 | F1 | 4E | 10 | 9F | 04 | 13 | 05 | 14 | 03 | 02 | 12 | 20 | 21 |
| 0x01 | 22 | 15 | 01 | 26 | 15 | 07 | 50 | 09 | 57 | 07 | ⓕ | | | | | |
| 0x02 | ⓕ | | E3 | 05 | 00 | 00 | 01 | 1D | 80 | 18 | 71 | 1C | 16 | 20 | 58 | 2C |
| 0x03 | 25 | 00 | A0 | 5A | 00 | 00 | 00 | 9E | 01 | 1D | 00 | 80 | 51 | D0 | 1A | 20 |
| 0x04 | 6E | 88 | 55 | 00 | A0 | 5A | 00 | 00 | 00 | 1A | 02 | 3A | 80 | 18 | 71 | 38 |
| 0x05 | 2D | 40 | 58 | 2C | 45 | 00 | A0 | 5A | 00 | 00 | 00 | 1E | 66 | 21 | 50 | B0 |
| 0x06 | 51 | 00 | 1B | 30 | 40 | 70 | 36 | 00 | A0 | 5A | 00 | 00 | 00 | 1E | 00 | 00 |
| 0x07 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ⓔ2 |

▪ Reference
- HDMI1 ~ HDMI4 / RGB
- In the data of EDID, bellows may be different by S/W or Input mode.

ⓐ Product ID

| HEX | EDID Table | DDC Function |
|---|---|---|
| 0001 | 0100 | Analog |
| 0001 | 0100 | Digital |

ⓑ Serial No: Controlled on production line.

ⓒ Month, Year: Controlled on production line:
ex) Monthly : '01' → '01'
Year : '2012' → '16'

ⓓ Model Name(Hex): LGTV

| Chassis | MODEL NAME(HEX) |
|---|---|
| LD33B | 00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20 |

ⓔ Checksum(LG TV): Changeable by total EDID data.

| | ⓔ1 | ⓔ2 | ⓔ3 |
|---|---|---|---|
| HDMI1 | 43 | 15 | X |
| HDMI2 | 43 | 05 | X |
| HDMI3 | 43 | F5 | X |

ⓕ Vendor Specific(HDMI)

| INPUT | MODEL NAME(HEX) |
|---|---|
| HDMI1 | 67 03 0C 00 10 00 80 2D |
| HDMI2 | 67 03 0C 00 20 00 80 2D |
| HDMI3 | 67 03 0C 00 30 00 80 2D |

## 4.2. White Balance Adjustment

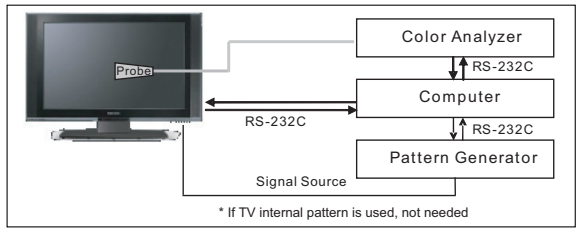
### 4.2.1. Overview

▪ W/B adj. Objective & How-it-works
(1) Objective: To reduce each Panel's W/B deviation
(2) How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
(3) Adjustment condition : normal temperature
1) Surrounding Temperature : 25 °C ± 5 °C
2) Surrounding Humidity : 20 % ~ 80 %

### 4.2.2. Equipment

(1) Color Analyzer: CA-210 (LED Module : CH 14)
(2) Adjustment Computer(During auto adj., RS-232C protocol is needed)
(3) Adjustment Remote control
(4) Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 78)
→ Only when internal pattern is not available
▪ Color Analyzer Matrix should be calibrated using CS-1000.

### 4.2.3. Equipment connection MAP




### 4.2.4. Adj. Command (Protocol)

<Command Format>

| START | 6E | A | 50 | A | LEN | A | 03 | A | CMD | A | 00 | A | VAL | A | CS | STOP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

- LEN: Number of Data Byte to be sent
- CMD: Command
- VAL: FOS Data value
- CS: Checksum of sent data
- A: Acknowledge
Ex) [Send: JA_00_DD] / [Ack: A_00_okDDX]

▪ RS-232C Command used during auto-adjustment.

| RS-232C COMMAND [CMD | ID | DATA] | Explantion |
|---|---|---|---|
| wb | 00 | 00 | Begin White Balance adjustment |
| wb | 00 | 10 | Gain adjustment(internal white pattern) |
| wb | 00 | 1f | Gain adjustment completed |
| wb | 00 | 20 | Offset adjustment(internal white pattern) |
| wb | 00 | 2f | Offset adjustment completed |
| wb | 00 | ff | End White Balance adjustment (internal pattern disappears ) |

Ex) wb 00 00 -> Begin white balance auto-adj.
wb 00 10 -> Gain adj.
ja 00 ff -> Adj. data
jb 00 c0
...
...
wb 00 1f → Gain adj. completed
*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.
wb 00 ff → End white balance auto-adj.

▪ Adj. Map
Applied Model : LD33B Chassis ALL MODELS

| | Adj. item | Command (lower caseASCII) | | Data Range (Hex.) | | Default (Decimal) |
|---|---|---|---|---|---|---|
| | | CMD1 | CMD2 | MIN | MAX | |
| Cool | R Gain | j | g | 00 | C0 | |
| | G Gain | j | h | 00 | C0 | |
| | B Gain | j | i | 00 | C0 | |
| | R Cut | | | | | |
| | G Cut | | | | | |
| | B Cut | | | | | |
| Medium | R Gain | j | a | 00 | C0 | |
| | G Gain | j | b | 00 | C0 | |
| | B Gain | j | c | 00 | C0 | |
| | R Cut | | | | | |
| | G Cut | | | | | |
| | B Cut | | | | | |
| Warm | R Gain | j | d | 00 | C0 | |
| | G Gain | j | e | 00 | C0 | |
| | B Gain | j | f | 00 | C0 | |
| | R Cut | | | | | |
| | G Cut | | | | | |

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### 4.2.5. Adj. method

(1) Auto adj. method

1) Set TV in adj. mode using POWER ON key.
2) Zero calibrate probe then place it on the center of the Display.
3) Connect Cable.(RS-232C to USB)
4) Select mode in adj. Program and begin adj.
5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
6) Remove probe and RS-232C cable to complete adj.

▪ W/B Adj. must begin as start command “wb 00 00” , and finish as end command “wb 00 ff”, and Adj. offset if need.

(2) Manual adjustment. method

1) Set TV in Adj. mode using POWER ON.
2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
3) Press ADJ key → EZ adjust using adj. R/C → 7. White-Balance then press the cursor to the right(key ►). (When right key(►) is pressed 204 Gray internal pattern will be displayed)
4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
5) Adjustment is performed in COOL, MEDIUM, WARM 3 modes of color temperature.

▪ If internal pattern is not available, use RF input. In EZ Adj. menu 7.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 204 Gray pattern.

▪ Adjustment condition and cautionary items

1) Lighting condition in surrounding area
Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location
: Color Analyzer(CA-210) probe should be within 10 cm and perpendicular of the module surface (80° ~ 100°)
3) Aging time
- After Aging Start, Keep the Power ON status during 5 Minutes.
- In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

### 4.2.6. Reference (White balance Adj. coordinate and color temperature)

▪ Luminance : 204 Gray

▪ Standard color coordinate and temperature using CS-1000 (over 26 inch)

| Mode | Coordinate | | Temp | Δuv |
|---|---|---|---|---|
| | x | y | | |
| Cool | 0.269 | 0.273 | 13000 K | 0.0000 |
| Medium | 0.285 | 0.293 | 9300 K | 0.0000 |
| Warm | 0.313 | 0.329 | 6500 K | 0.0000 |

▪ Standard color coordinate and temperature using CA-210(CH 14)

| Mode | Coordinate | | Temp | Δuv |
|---|---|---|---|---|
| | x | y | | |
| Cool | 0.269 ± 0.002 | 0.273 ± 0.002 | 13000 K | 0.0000 |
| Medium | 0.285 ± 0.002 | 0.293 ± 0.002 | 9300 K | 0.0000 |
| Warm | 0.313 ± 0.002 | 0.329 ± 0.002 | 6500K | 0.0000 |

### 4.2.7. ALELF & EDGE LED White balance table

- EDGE LED module change color coordinate because of aging time.
- Apply under the color coordinate table, for compensated aging time.

* Normal Line

[LN5xxx, LA6xxx, LA7xxx, LA8xxx]

| NC4.0 | Aging time (Min) | Cool | | Medium | | Warm | |
|---|---|---|---|---|---|---|---|
| | | X | y | x | y | x | y |
| | | 271 | 270 | 286 | 289 | 313 | 329 |
| 1 | 0-2 | 283 | 287 | 298 | 306 | 322 | 342 |
| 2 | 3-5 | 282 | 285 | 297 | 304 | 321 | 340 |
| 3 | 6-9 | 281 | 284 | 296 | 303 | 320 | 339 |
| 4 | 10-19 | 279 | 281 | 294 | 300 | 318 | 336 |
| 5 | 20-35 | 277 | 277 | 292 | 296 | 316 | 332 |
| 6 | 36-49 | 275 | 274 | 290 | 293 | 314 | 329 |
| 7 | 50-79 | 273 | 272 | 288 | 291 | 312 | 327 |
| 8 | 80-119 | 272 | 271 | 287 | 290 | 311 | 326 |
| 9 | Over 120 | 271 | 270 | 286 | 289 | 310 | 325 |

*Aging Chamber

[LN5xxx, LA6xxx, LA7xxx, LA8xxx]

| NC4.0 | Aging time (Min) | Cool | | Medium | | Warm | |
|---|---|---|---|---|---|---|---|
| | | X | y | x | y | x | y |
| | | 271 | 270 | 286 | 289 | 313 | 329 |
| 1 | 0-5 | 282 | 285 | 297 | 304 | 321 | 340 |
| 2 | 6-10 | 278 | 280 | 293 | 299 | 317 | 335 |
| 3 | 11-20 | 275 | 275 | 290 | 294 | 314 | 330 |
| 4 | 21-30 | 272 | 272 | 287 | 291 | 311 | 327 |
| 5 | 31-40 | 269 | 269 | 284 | 288 | 308 | 324 |
| 6 | 41-50 | 268 | 267 | 283 | 286 | 307 | 322 |
| 7 | 51-80 | 267 | 266 | 282 | 285 | 306 | 321 |
| 8 | 81-119 | 266 | 264 | 281 | 283 | 305 | 319 |
| 9 | Over 120 | 265 | 263 | 280 | 282 | 304 | 318 |

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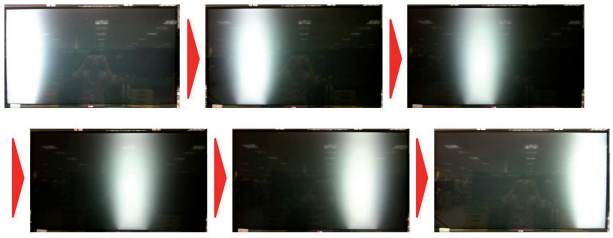
## 4.3. Local Dimming Function Check

Step 1) Turn on TV.

Step 2) At the Local Dimming mode, module Edge Backlight moving right to left Back light of IOP module moving.

Step 3) Confirm the Local Dimming mode.

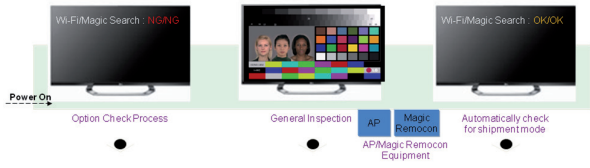
Step 4) Press "exit" key.

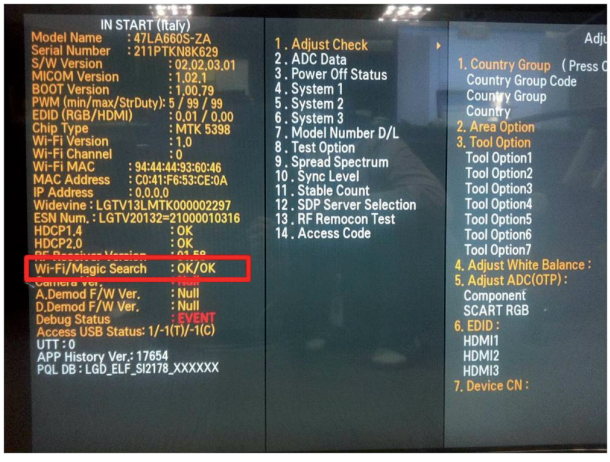


Local Dimming Demo.
(Edge LED Model)

## 4.4. Magic Motion Remote control test

- Results are automatically marked in Instart OSD after through the AP/Magic Remocon Equipment on the line




## 4.5. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])

* HDMI mode NO. 872 , pattern No.83

(1) Please input 3D test pattern like below.

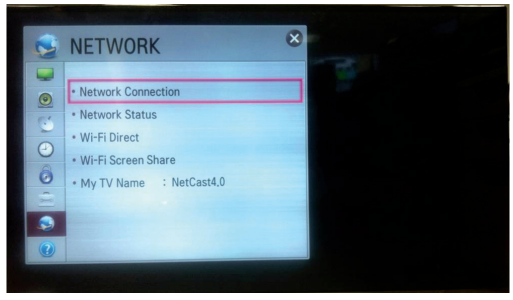
(2) When 3D OSD appear automatically, then select OK key.

(3) Don't wear a 3D Glasses, check the picture like below.

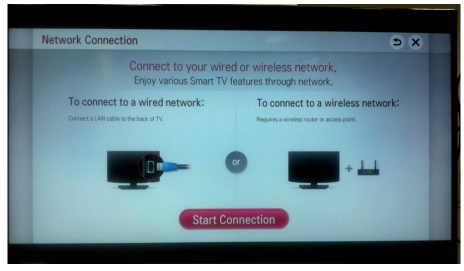
## 4.6. Wi-Fi Test

Step 1) Turn on TV

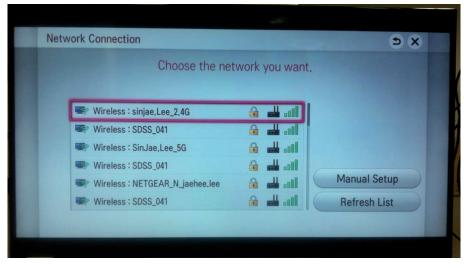
Step 2) Select Network Connection option in Network Menu.




Step 3) Select Start Connection button in Network Connection.


Network Connection
Connect to your wired or wireless network.
Enjoy various Smart TV features through network.
To connect to a wired network:
To connect to a wireless network:
or
Start Connection

Step 4) If the system finds any AP like blow PIC, it is working well.

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## 4.7. LNB voltage and 22KHz tone check

(only for DVB-S/S2 model)

▪ Test method

(1) Set TV in Adj. mode using POWER ON.
(2) Connect cable between satellite ANT and test JIG.
(3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
(4) Check LED light 'ON' at 18 V menu.
(5) Check LED light 'ON' at 22 KHz tone menu.
(6) Press Blue key(ETC+PIP INPUT) in Adj Remote control to make LNB off.
(7) Check LED light 'OFF' at 18 V menu.
(8) Check LED light 'OFF' at 22 KHz tone menu.

▪ Test result

(1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
(2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

## 4.8. Option selection per country

### 4.8.1. Overview

- Option selection is only done for models in Non-EU

### 4.8.2. Method

(1) Press ADJ key on the Adj. R/C, then select Country Group Meun
(2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ►◄ key.

# 5. Tool Option selection

▪ Method : Press "ADJ" key on the Adjustment remote control, then select Tool option.

# 6. Ship-out mode check(In-stop)

▪ After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

# 7. GND and Internal Pressure check

## 7.1. Method

(1) GND & Internal Pressure auto-check preparation
- Check that Power cord is fully inserted to the SET. (If loose, re-insert)

(2) Perform GND & Internal Pressure auto-check
- Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
- Connect D-terminal to AV JACK TESTER
- Auto CONTROLLER(GWS103-4) ON
- Perform GND TEST
- If NG, Buzzer will sound to inform the operator.
- If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX.)
- Perform I/P test
- If NG, Buzzer will sound to inform the operator.
- If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

## 7.2. Checkpoint

▪ TEST voltage
- GND: 1.5 KV / min at 100 mA
- SIGNAL: 3 KV / min at 100 mA

▪ TEST time: 1 second

▪ TEST POINT
- GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
- Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL

▪ LEAKAGE CURRENT: At 0.5 mArms

# 8. Audio

Measurement condition:
(1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation
(2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms
(3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

| No. | Item | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| 1. | Audio practical max Output, L/R (Distortion=10% max Output) | 9 | 10 | 12 | W | EQ Off<br>AVL Off<br>Clear Voice Off |
| | | | 8.10 | 10.8 | Vrms | |
| 2. | Speaker (8Ω Impedance) | 9 | 10 | 12 | W | |

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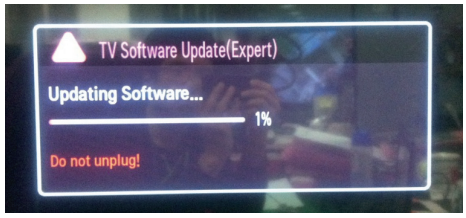
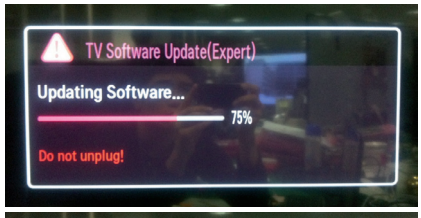
# 9. USB S/W Download(Service only)

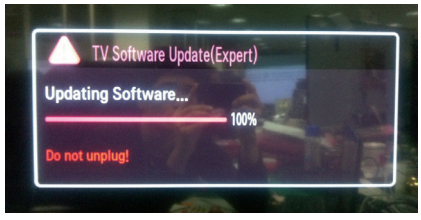
(1) Put the USB Stick to the USB socket
(2) Automatically detecting update file in USB Stick
- If your downloaded program version in USB Stick is Lower, it didn't work.
  But your downloaded version is Higher, USB data is automatically detecting (Download Version High & Power only mode, Set is automatically Download)

(3) Show the message "Do not unplug!"




(4) Updating is starting.




(5) Updating Completed, The TV will restart automatically
(6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
  * If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ATV test on production line.

* After downloading, have to adjust Tool Option again.
(1) Push "IN-START" key in service remote control.
(2) Select "Tool Option 1" and push "OK" key.
(3) Punch in the number. (Each model has their number)

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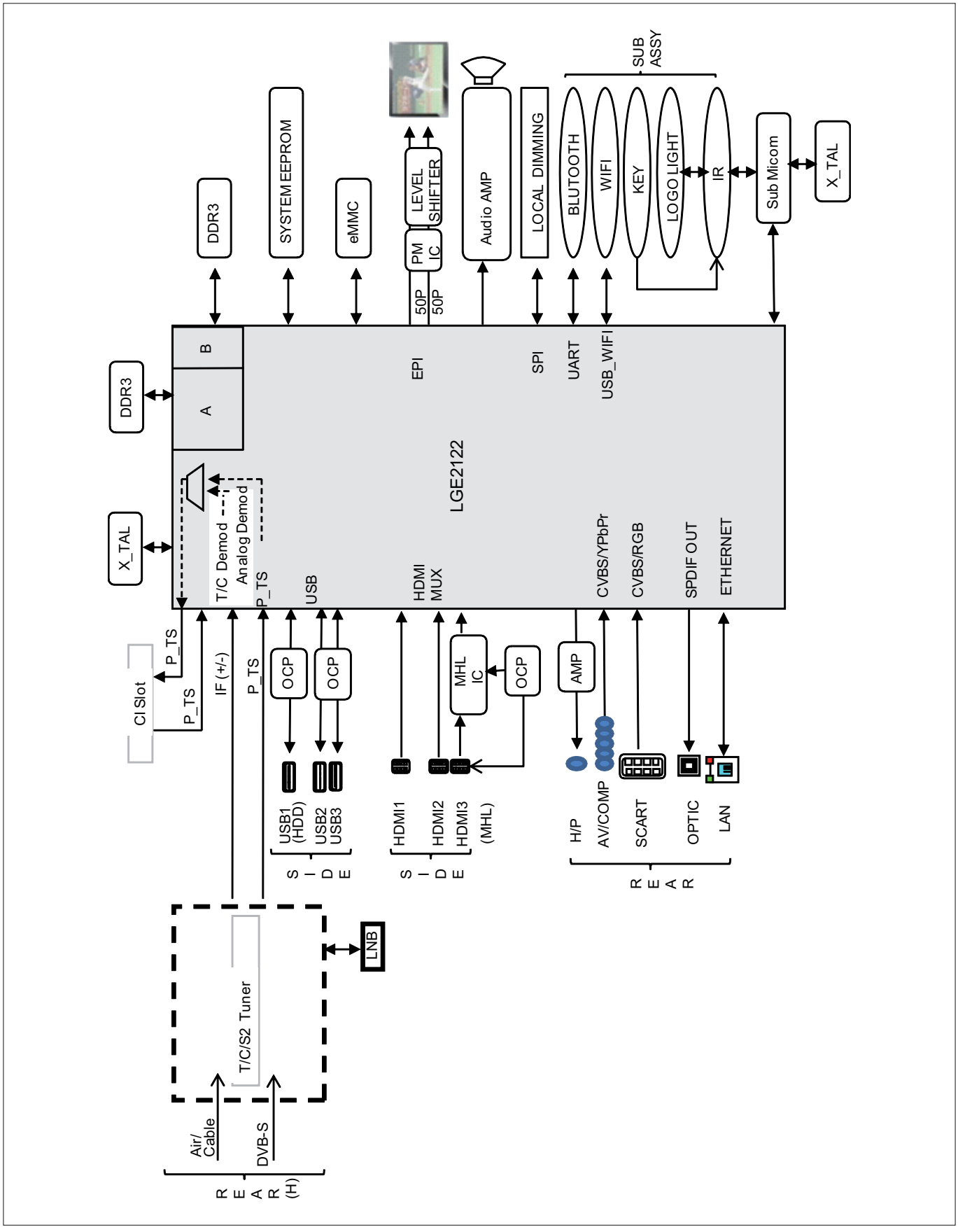
# BLOCK DIAGRAM

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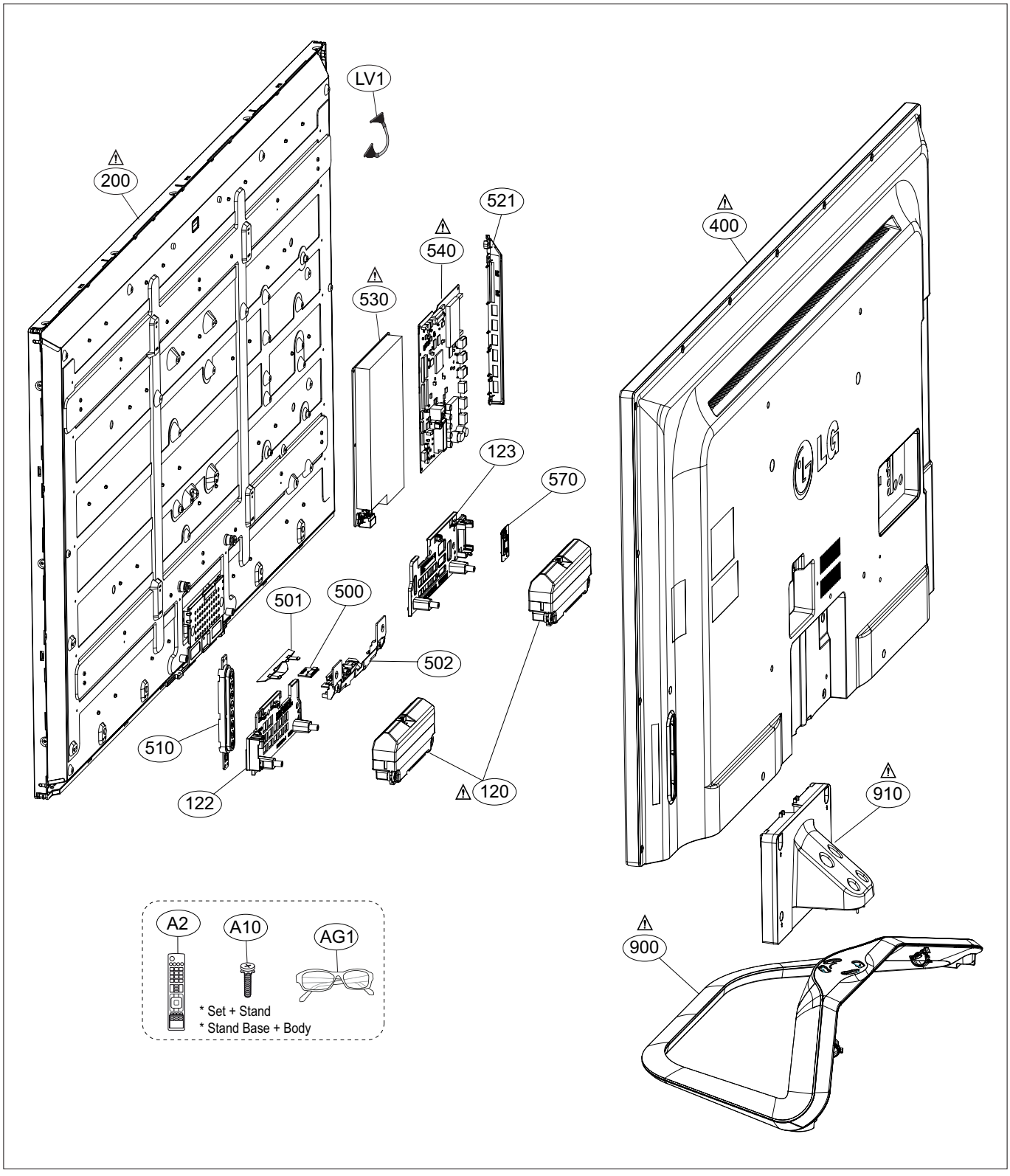
# EXPLODED VIEW

**IMPORTANT SAFETY NOTICE**

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and EXPLODED VIEW.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

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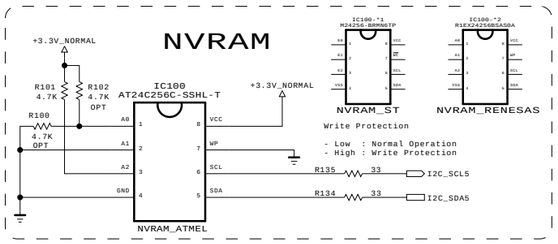
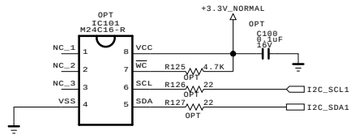
# EAX64797001* : LD33B
# EAX64872101* : LA33B

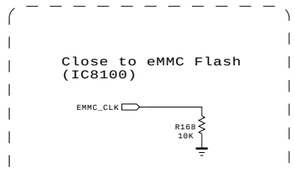
## NVRAM



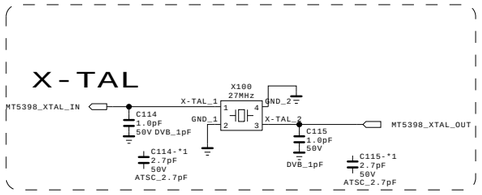

## HDCP EEPROM



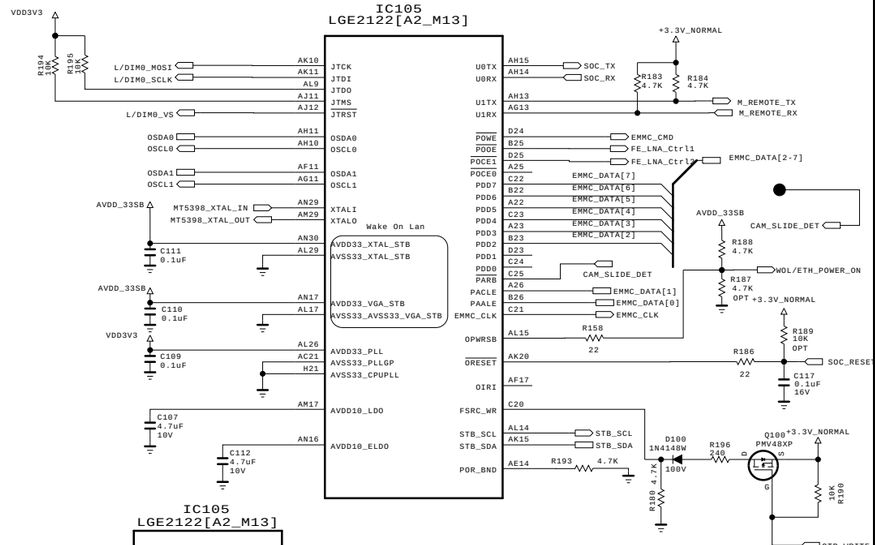

## Close to eMMC Flash (IC8100)



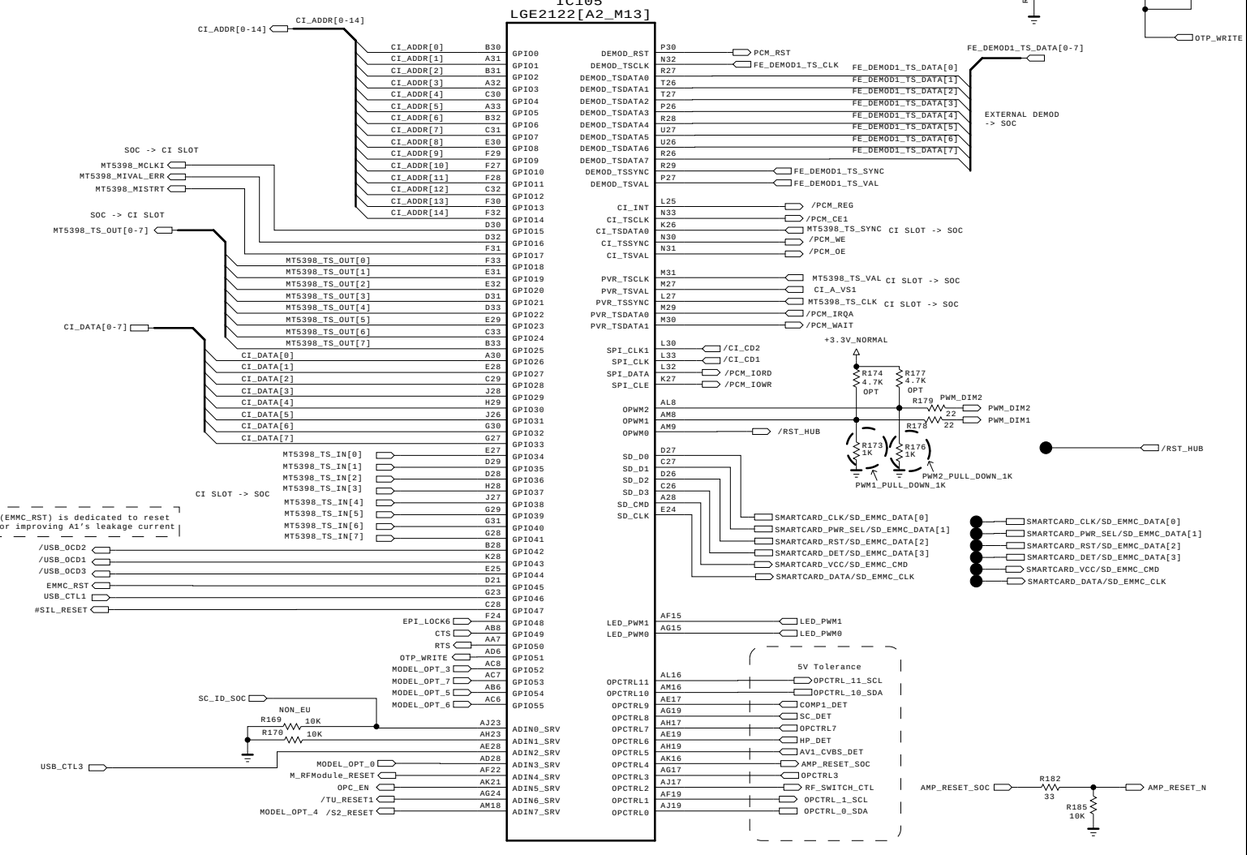

## X-TAL



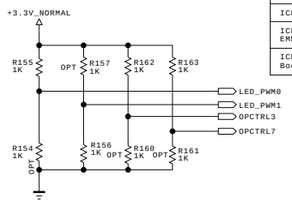

## IC105 LGE2122[A2_M13]



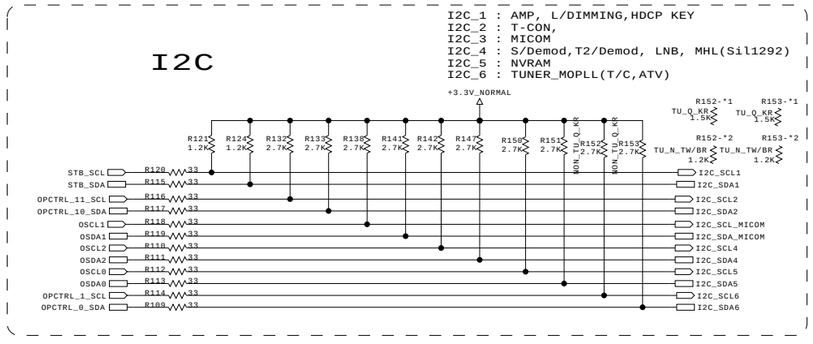

## IC105 LGE2122[A2_M13]



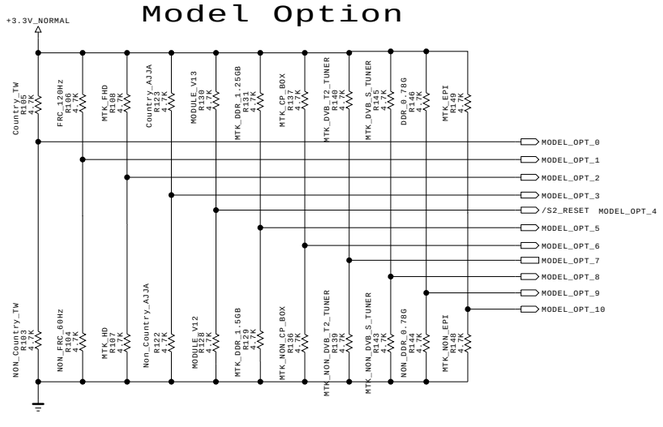

| STRAPPING | LED_PWM0 | LED_PWM1 | OPCTRL3 | OPCTRL7 |
|---|---|---|---|---|
| ICE mode + 27M + serial boot | 1 | 0 | 0 | 0 |
| ICE mode + 27M + ROM to Nand boot | 1 | 0 | 0 | 1 |
| ICE mode + 27M + ROM to 60bit ECC Nand boot | 1 | 0 | 1 | 0 |
| ICE mode + 27M + ROM to eMMC boot from EMMC pins (share pins w/s NAND) | 1 | 0 | 1 | 1 |
| ICE mode + 27M + ROM to eMMC Boot from SDIO pins | 1 | 1 | 0 | 0 |




## I2C




## Model Option




| | | HIGH | LOW |
|---|---|---|---|
| MODEL_OPT_0 | Country_TW | TW | Non_TW |
| MODEL_OPT_1 | FRC | FRC(120Hz) | No FRC(60Hz) |
| MODEL_OPT_2 | Panel | FHD | HD |
| MODEL_OPT_3 | Country_AJJA | AJJA | Non_AJJA |
| MODEL_OPT_4 | Module | V13 | V12 |
| MODEL_OPT_5 | DDR | DDR_1.25G | DDR_1.5G |
| MODEL_OPT_6 | CP BOX | Enable | Disable |
| MODEL_OPT_7 | T2 Tuner | Support | Not Support |
| MODEL_OPT_8 | S Tuner | Support | Not Support |
| MODEL_OPT_9 | DDR | DDR_0.78G | NON_DDR_0.78G |
| MODEL_OPT_10 | EPI | Support | Not Support |

| | DDR_1.25G | DDR_1.5G | DDR_0.768G |
|---|---|---|---|
| MODEL_OPT_5 | High | Low | High |
| MODEL_OPT_9 | Low | Low | High |

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| BLOCK | | SHEET | 8 |

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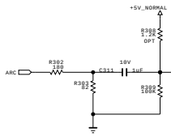
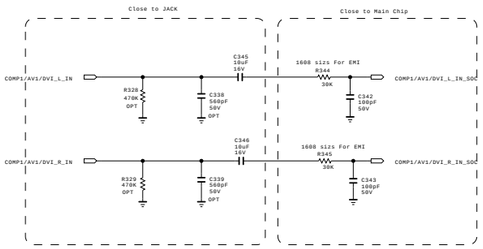
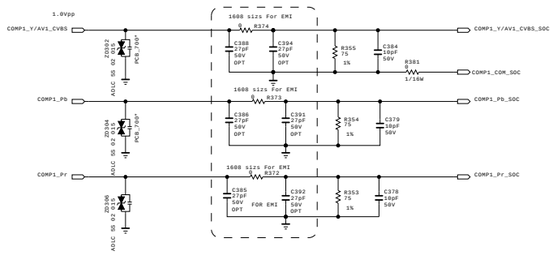
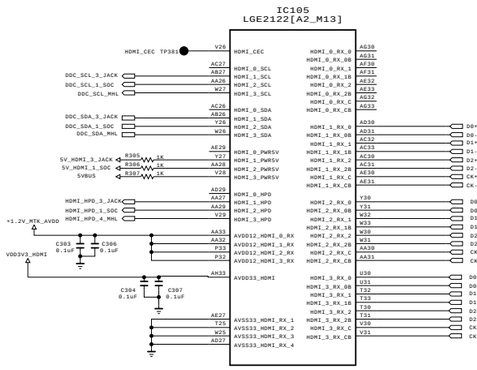
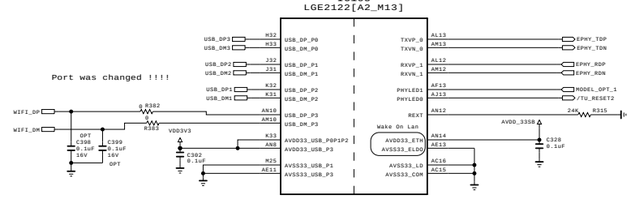
# PLACE AT JACK SIDE

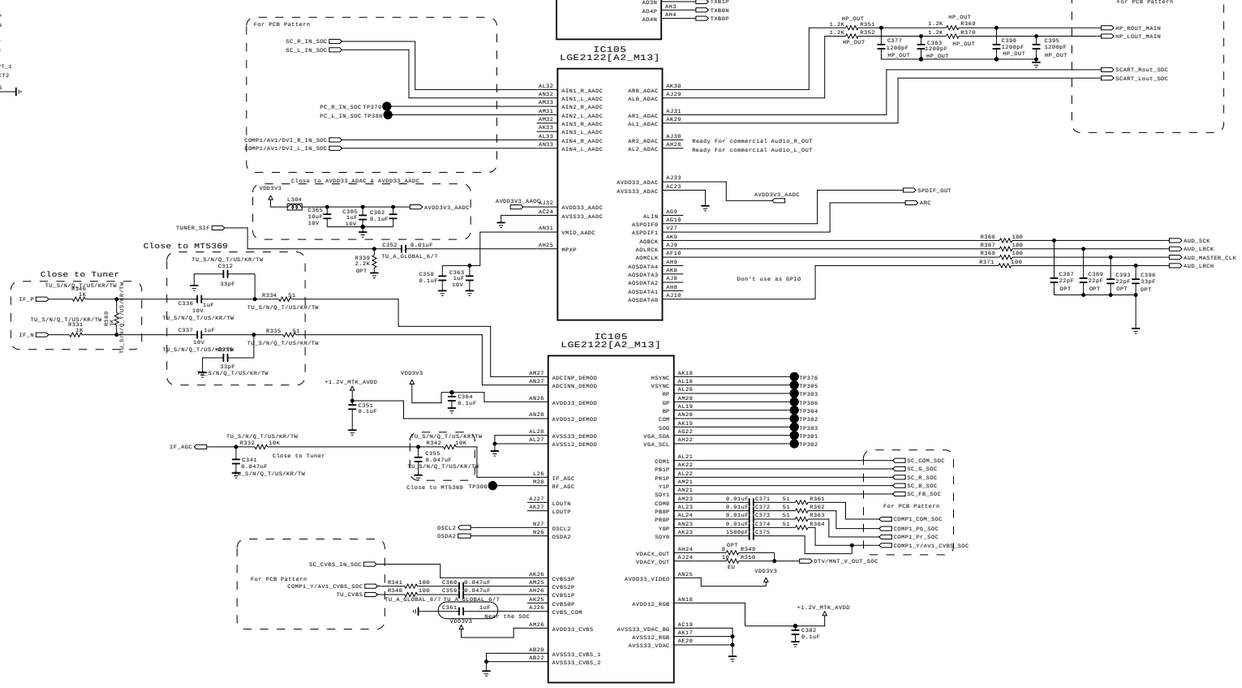


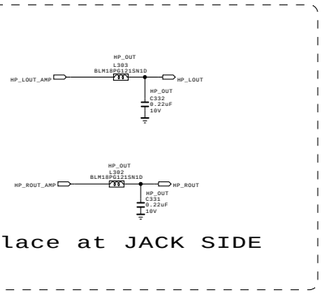







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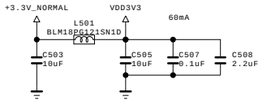


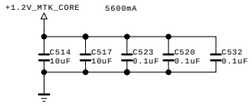


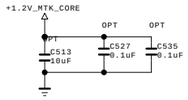


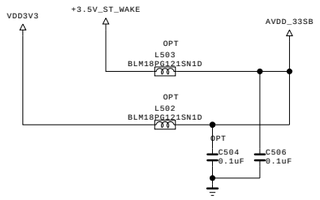


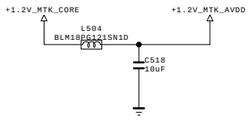


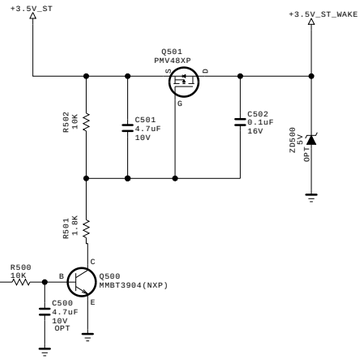


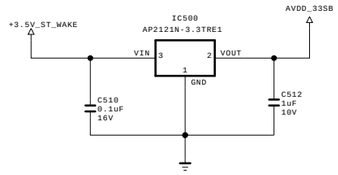


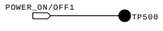


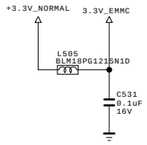


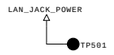


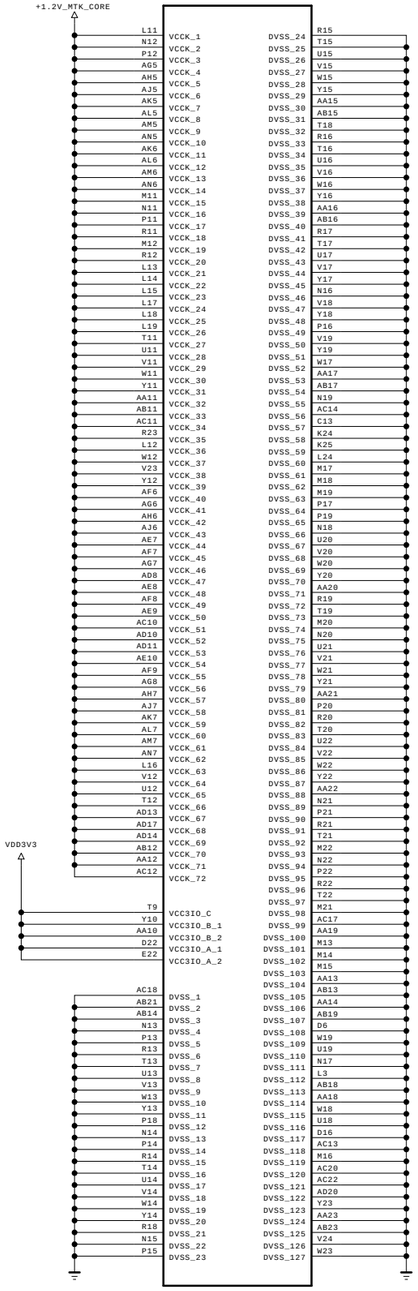


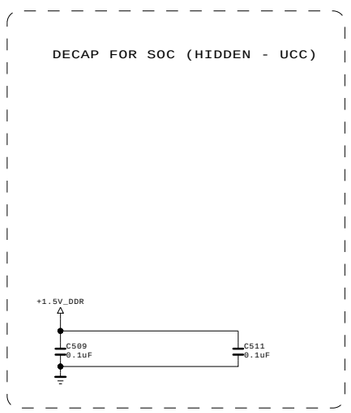


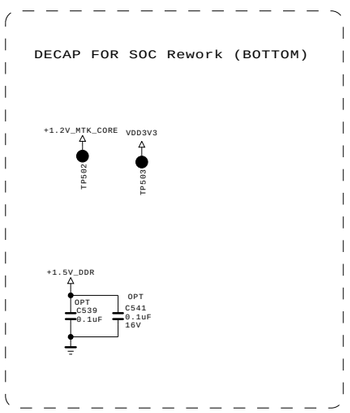


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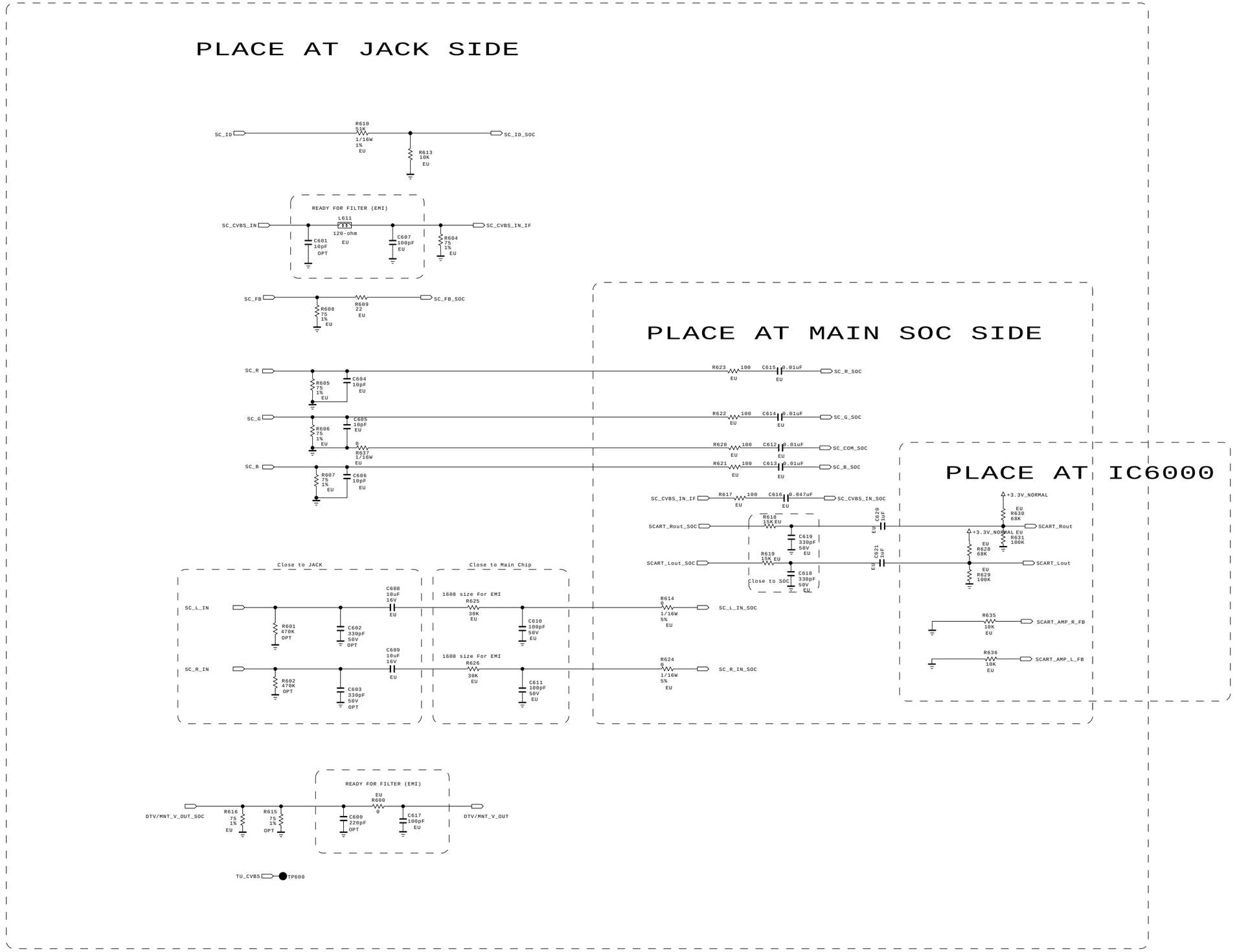


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| BLOCK | | SHEET | 11 |

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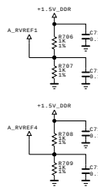


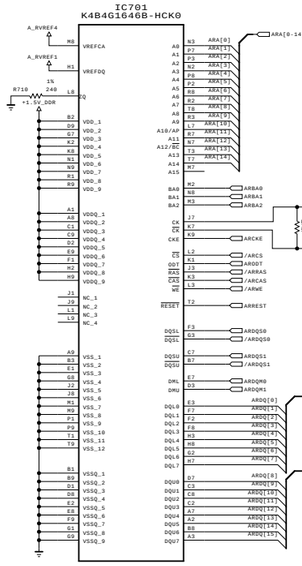


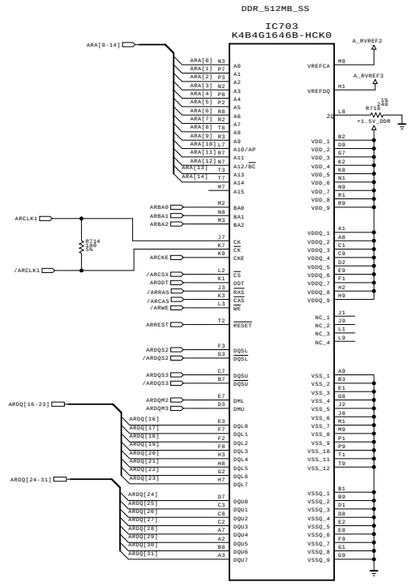


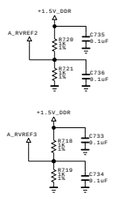


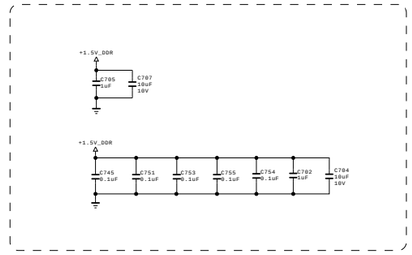


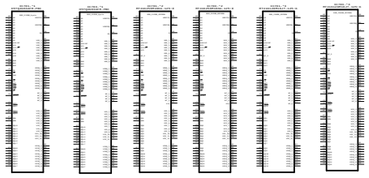

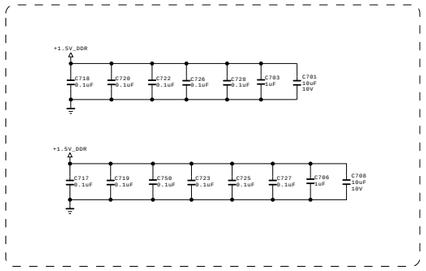


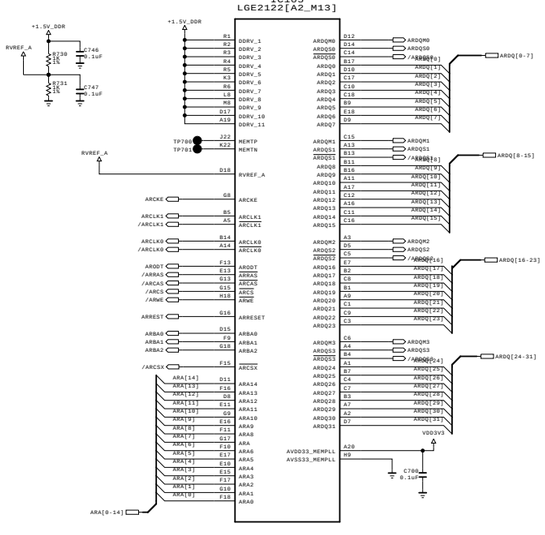


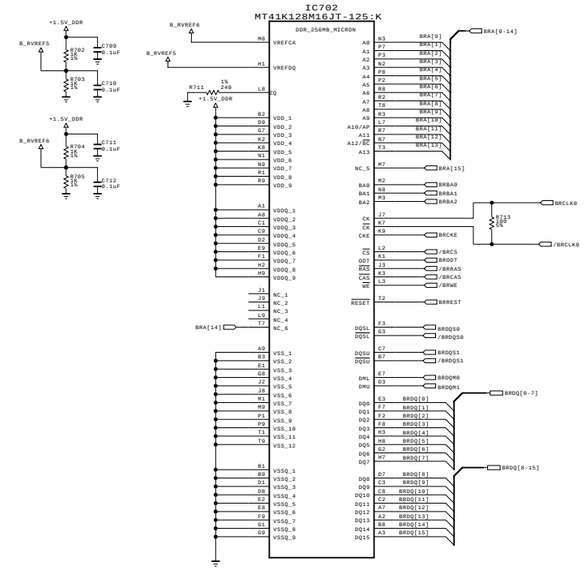


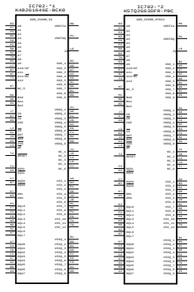

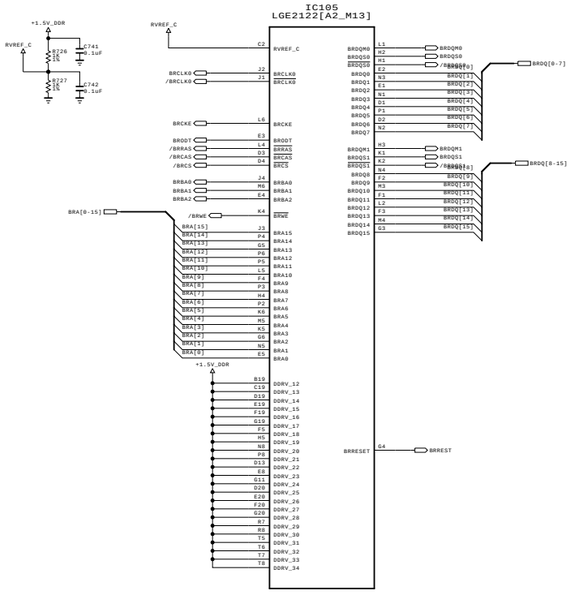


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|---|---|---|---|
| BLOCK | DDR ONE SIDE | SHEET | 12 |

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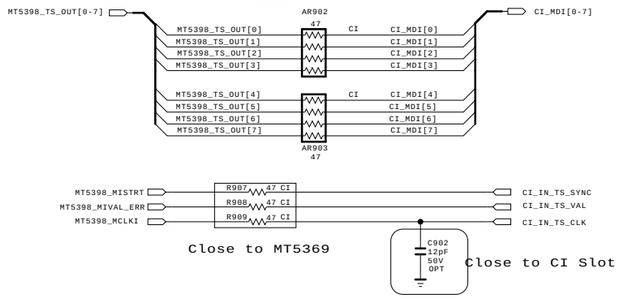
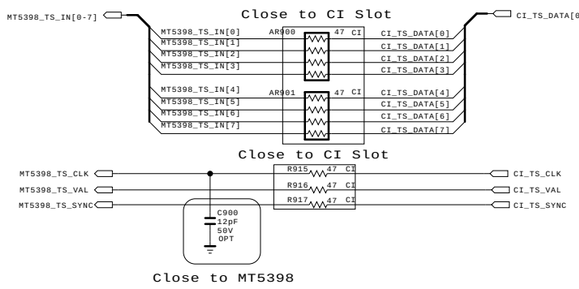
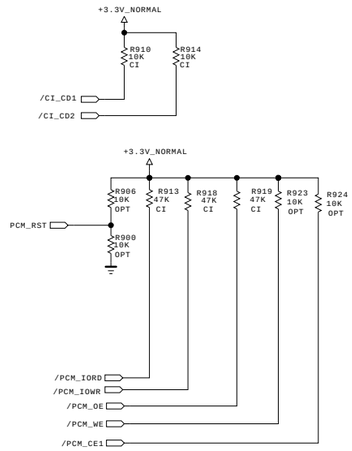
## CI TS INPUT

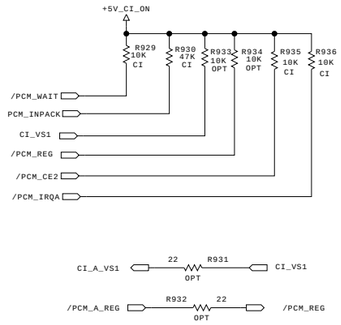


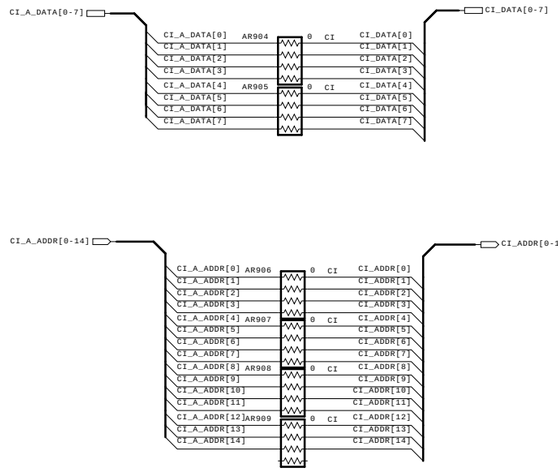

## CI TS OUTPUT

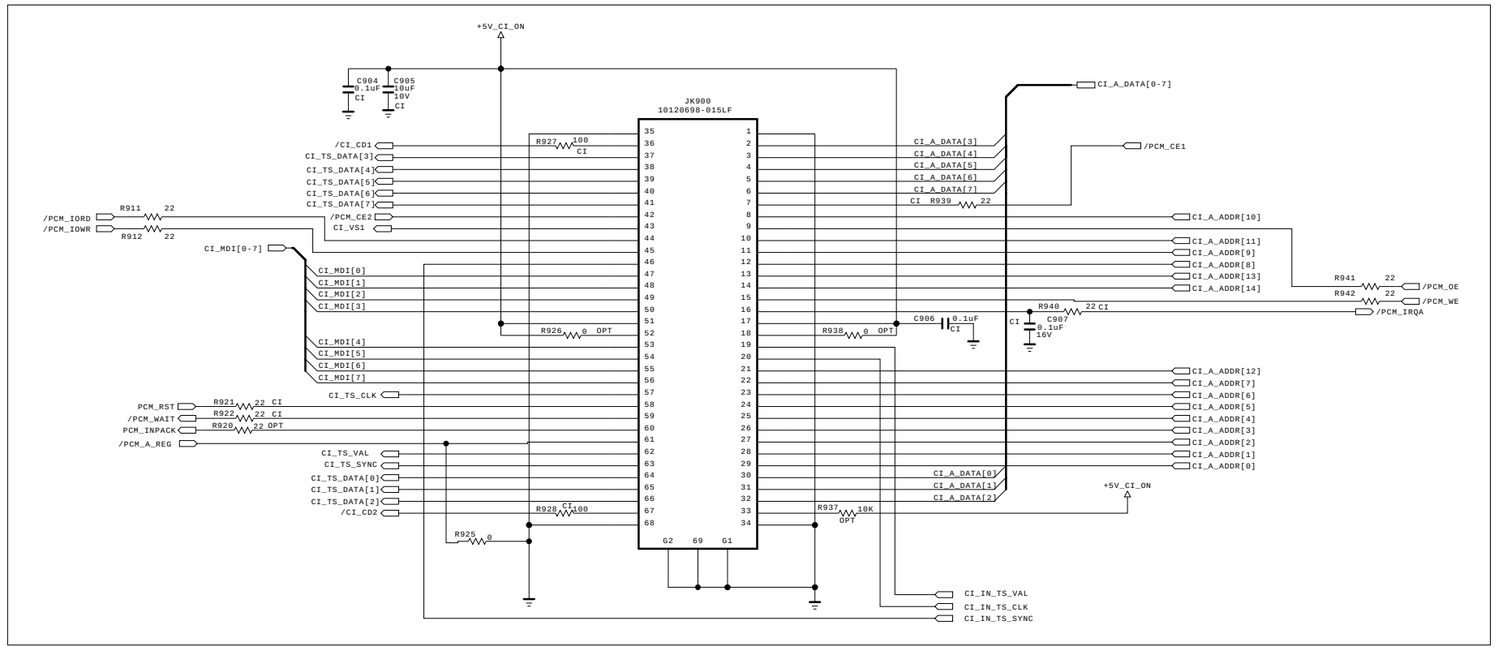



## CI DETECT

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| BLOCK | | SHEET | 13 |

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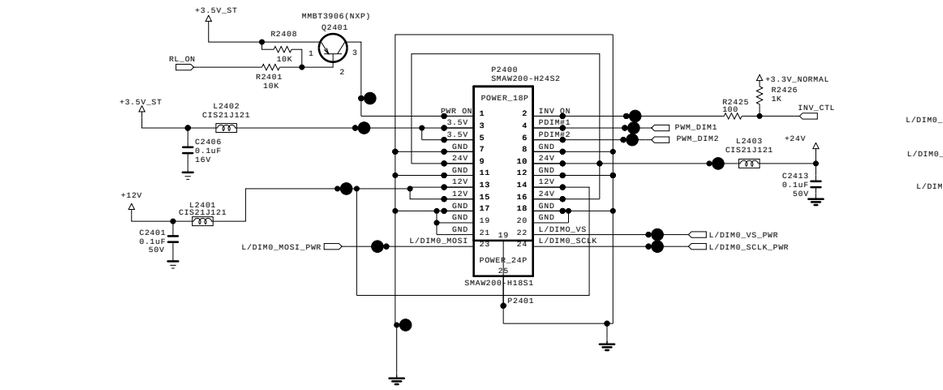


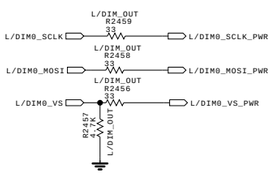


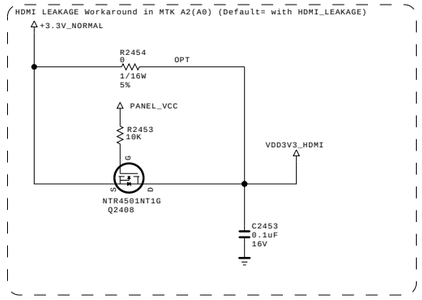


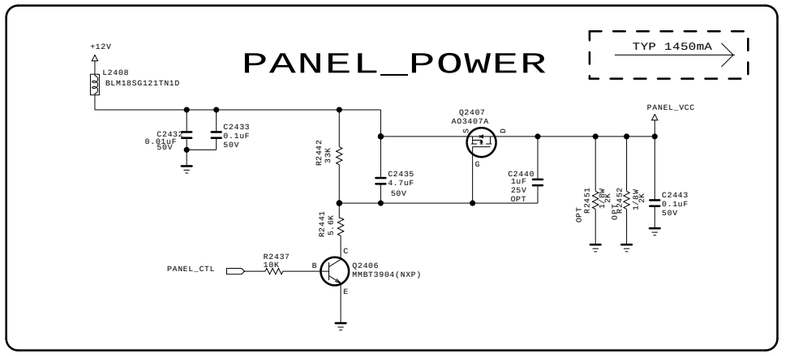


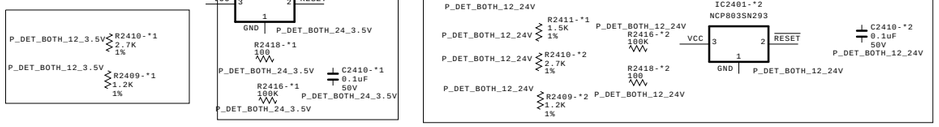


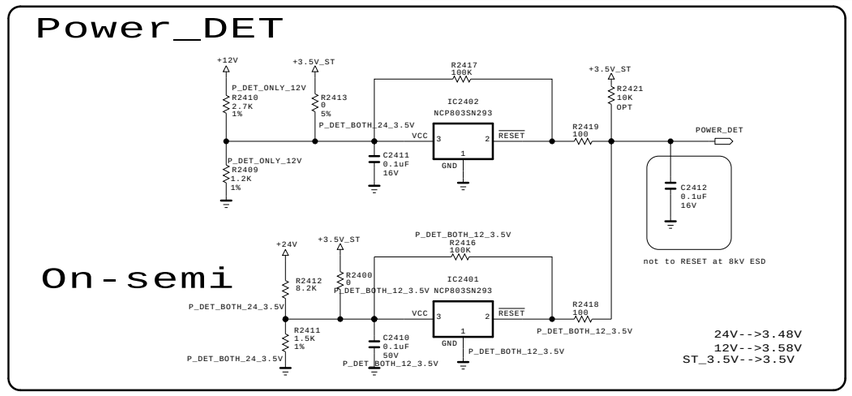


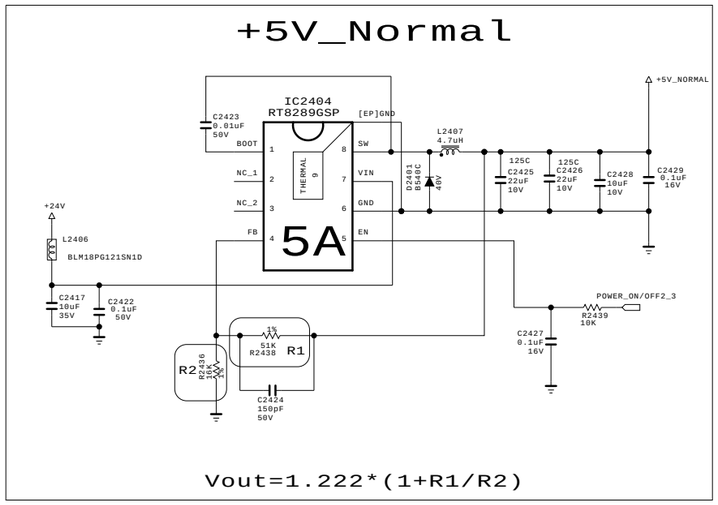


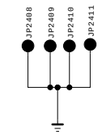


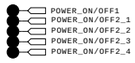


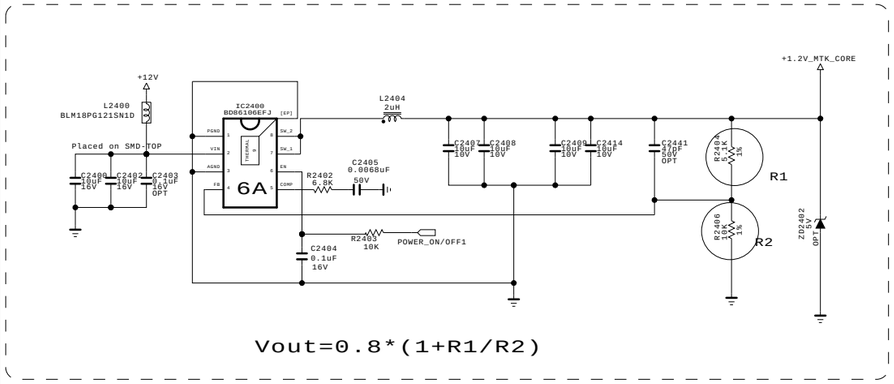


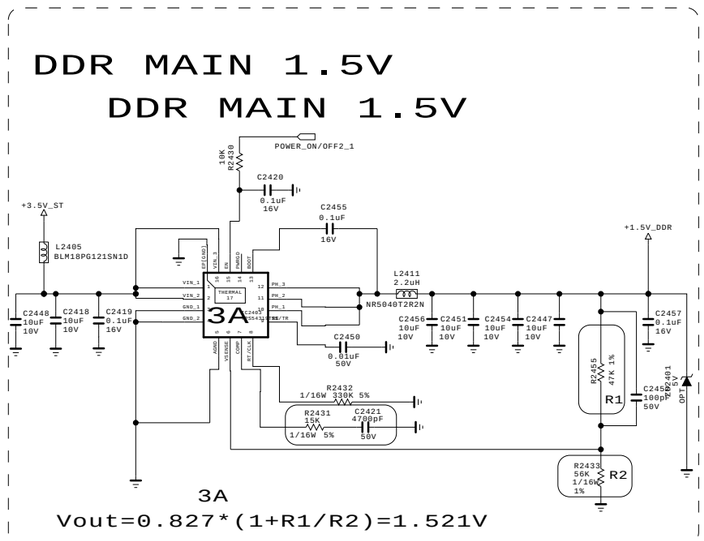


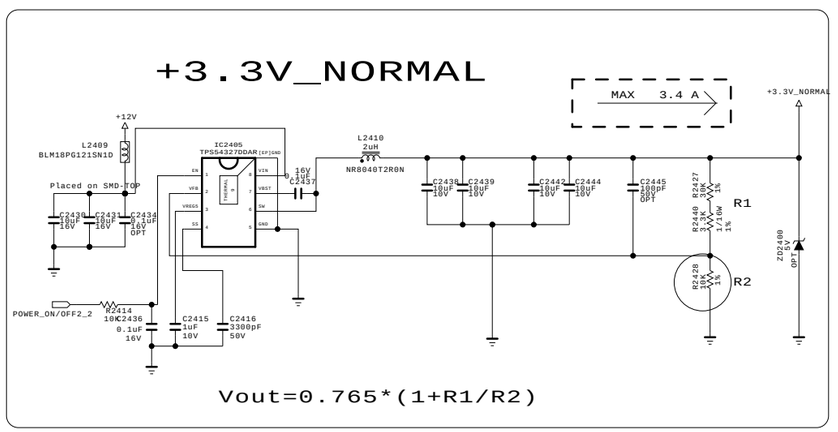


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| | | | |
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| MODEL | MID_POWER | DATE | 2011.11.25 |
| BLOCK | | SHEET | 24 |

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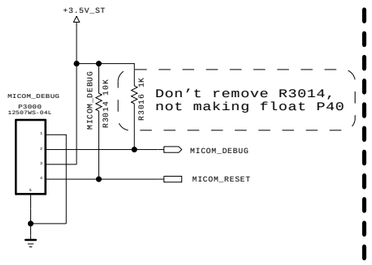
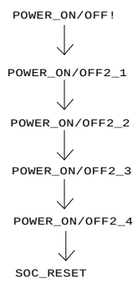
# Renesas MICOM

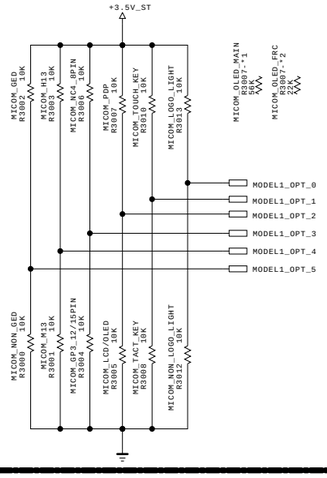
## For Debug




## GP4 High/MID Power SEQUENCE

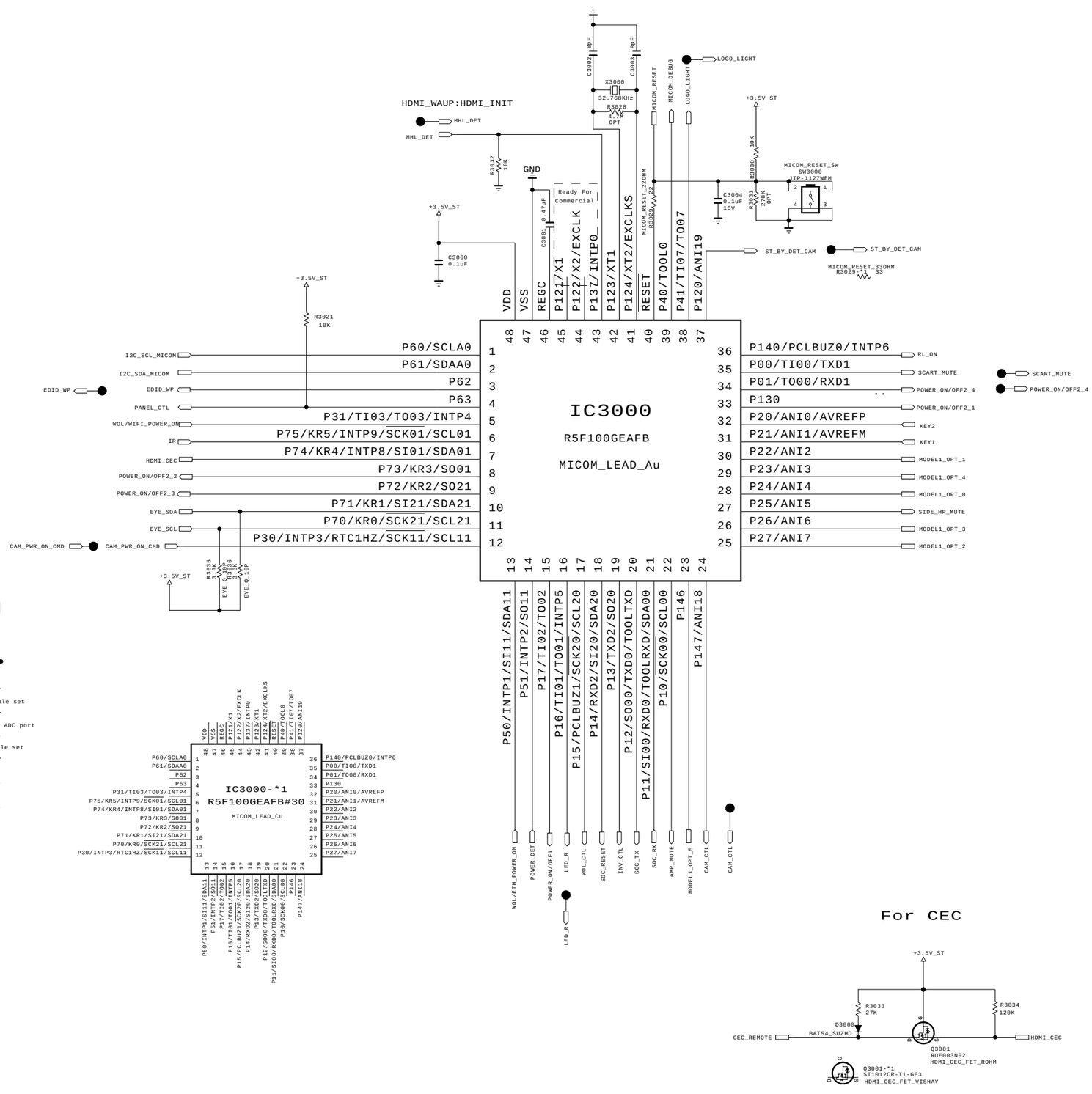



## MICOM MODEL OPTION




## MICOM MODEL OPTION

| | 0 | 1 | |
|---|---|---|---|
| MODEL_OPT_0 | NON LOGO | LOGO | For LOGO LIGHT |
| MODEL_OPT_1 | TACT_KEY | TOUCH_KEY | Ready for sample set |
| MODEL_OPT_2 | LCD / OLED | PDP | Need to Assign ADC port |
| MODEL_OPT_3 | IR_wafer(12/15) | IR_wafer(10pin) | Ready for sample set |
| MODEL_OPT_4 | M13 | H13 | |
| MODEL_OPT_5 | NON_GED | GED | |




## For CEC

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|---|---|---|---|
| BLOCK | MICOM | SHEET | 30 |

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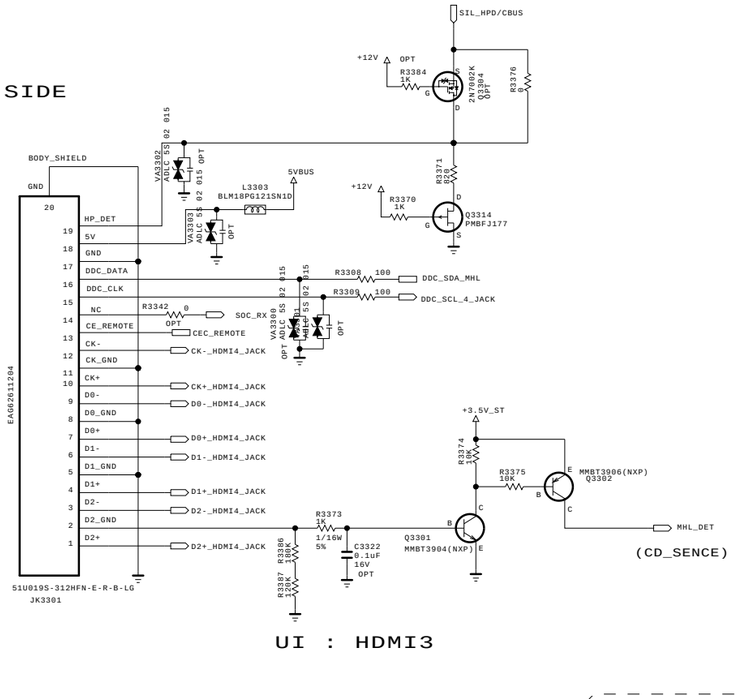
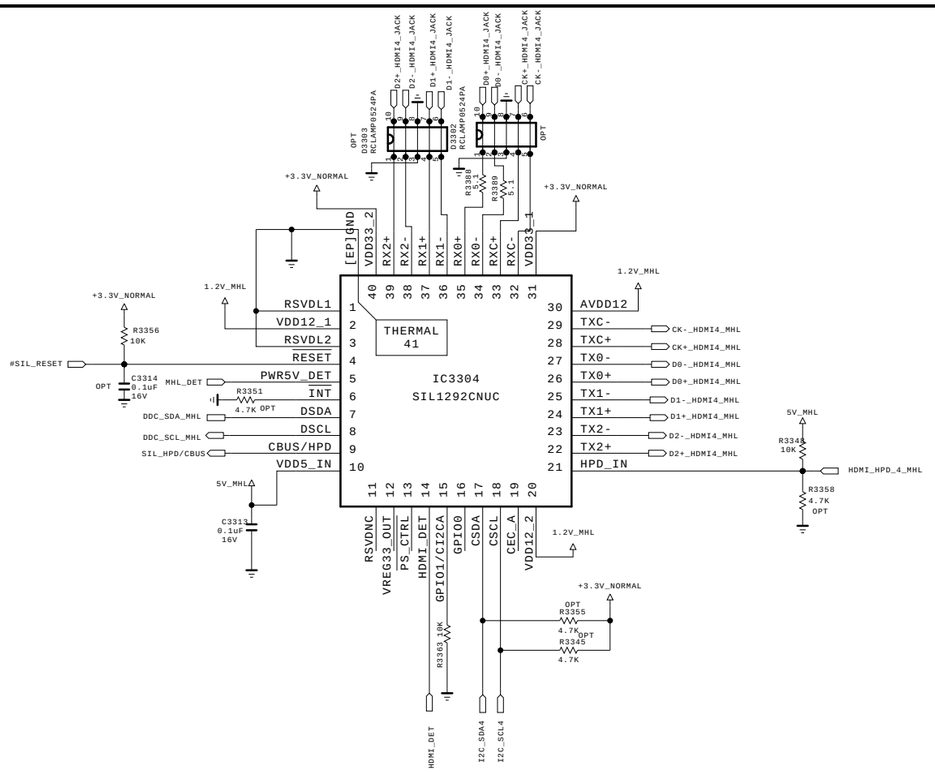
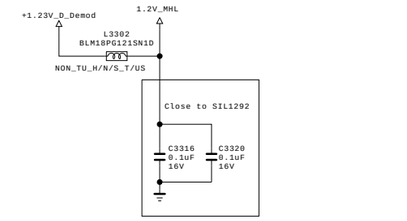
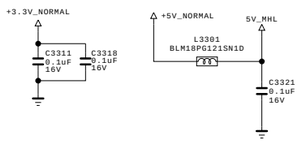
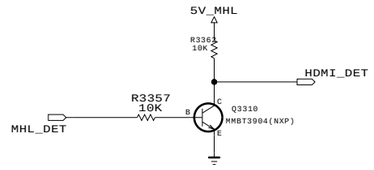


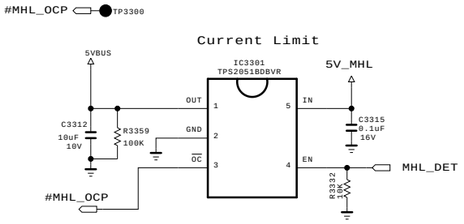

UI : HDMI3



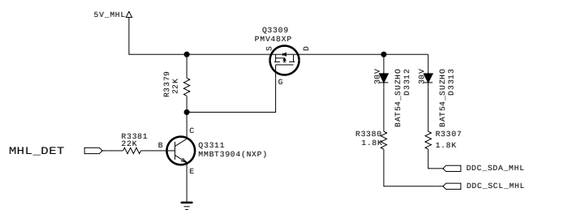



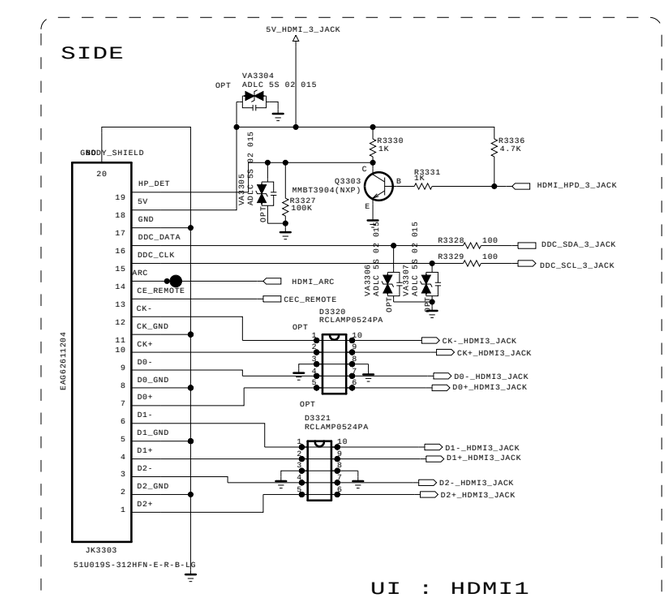



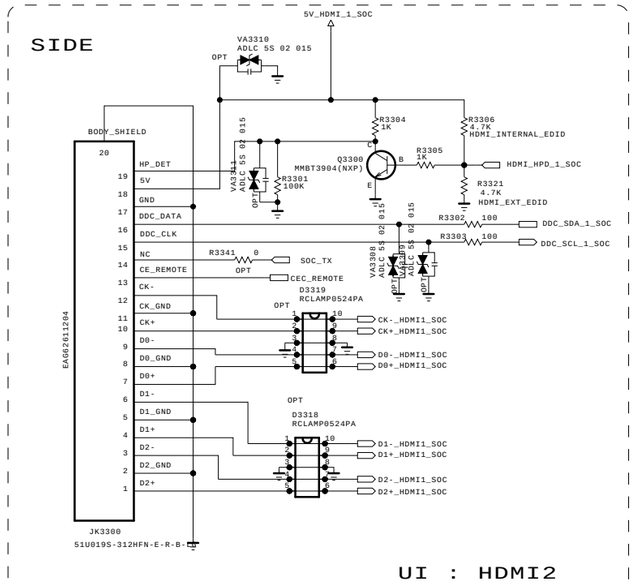




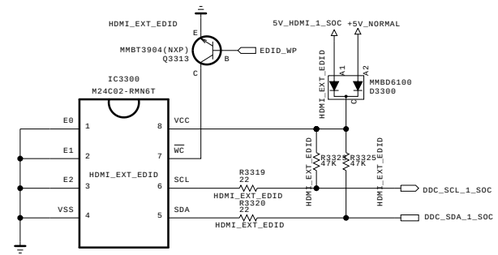


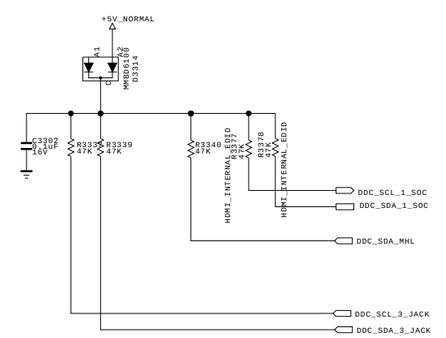




UI : HDMI1




UI : HDMI2

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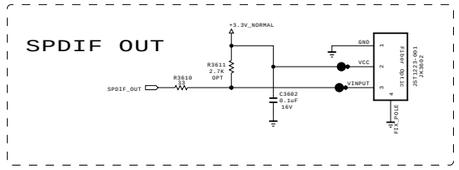
# SPDIF

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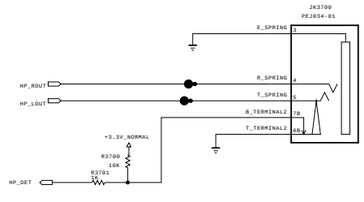


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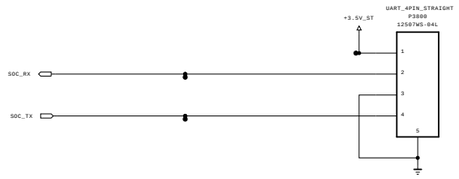
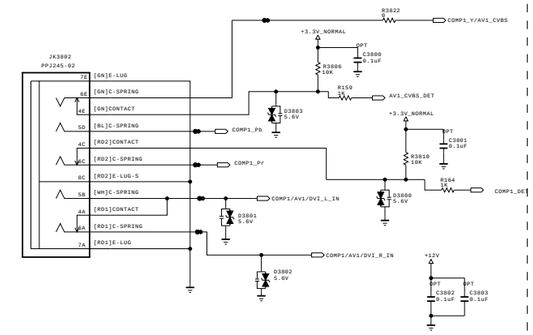
## UART FOR DEBUG




## AV/COMPONENT REAR

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|---|---|---|---|
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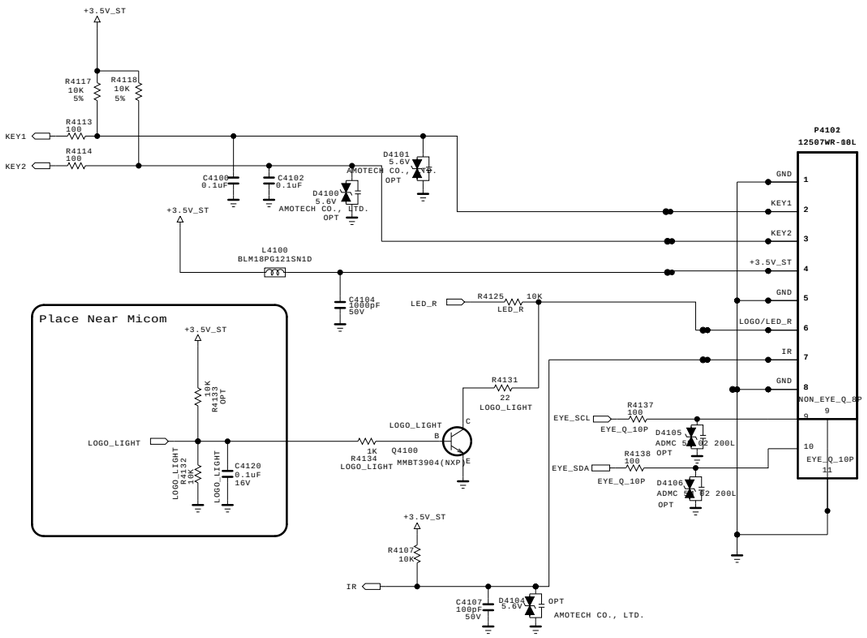


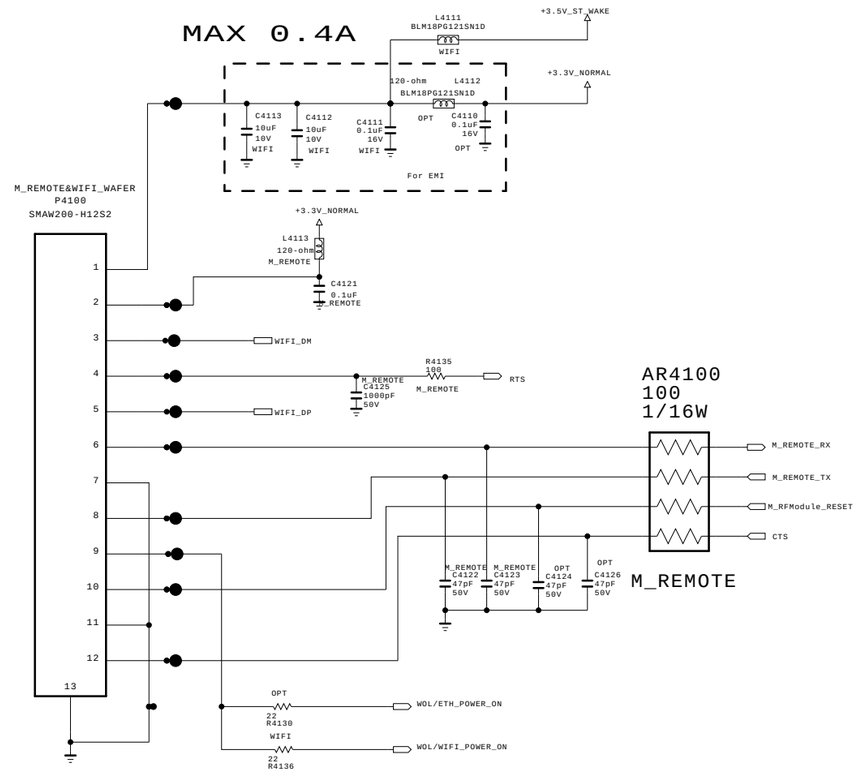


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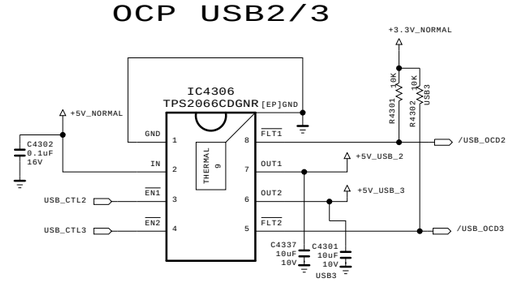
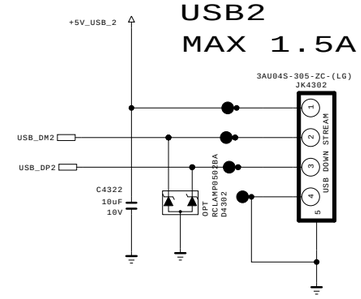
## OCP USB2/3




## USB2
## MAX 1.5A

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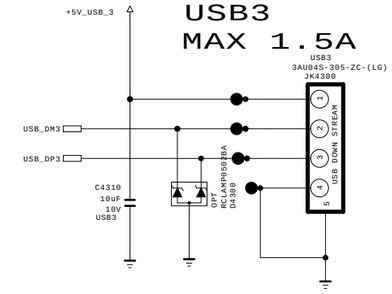
## MAX 1.5A

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| MODEL | USB2_USB3 | DATE | 2012.7.11 |
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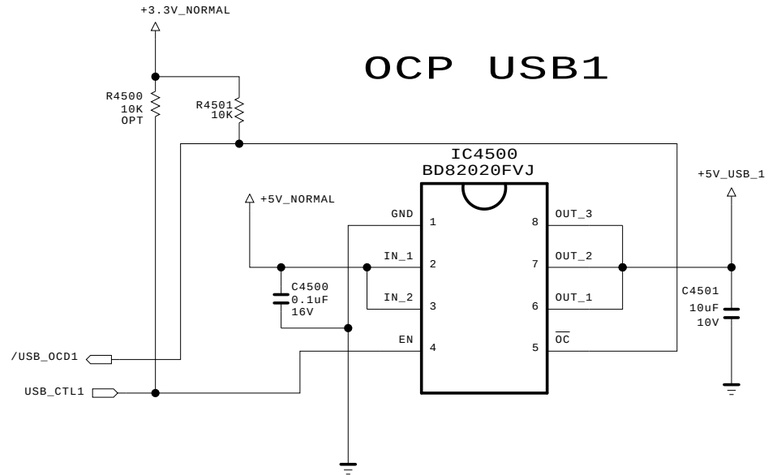
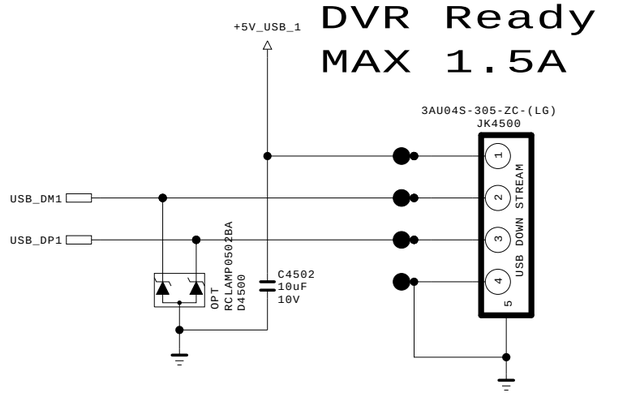
# OCP USB1




# USB1

## DVR Ready
## MAX 1.5A

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| MODEL | | DATE | |
|---|---|---|---|
| BLOCK | | SHEET | / |

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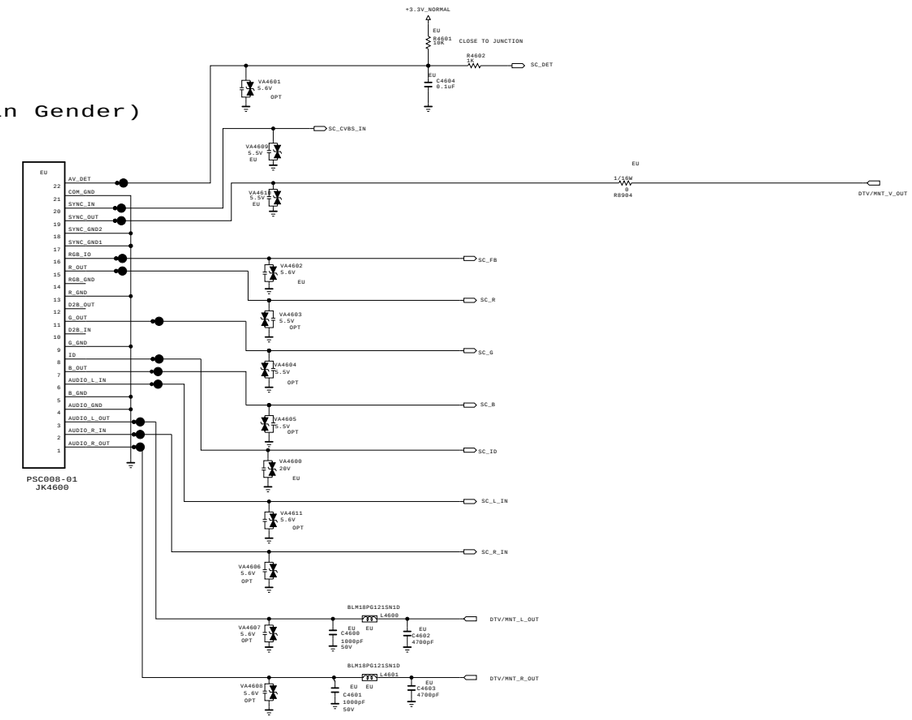
# Full Scart(18 Pin Gender)

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| MODEL | SCART GENDER | DATE | 2011.10.26 |
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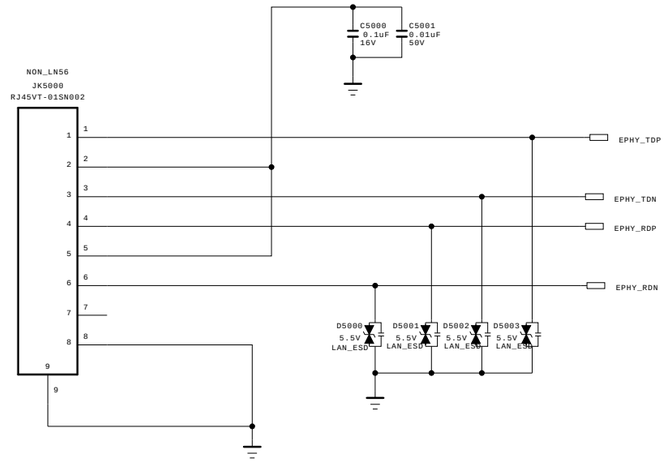
# Ethernet Block

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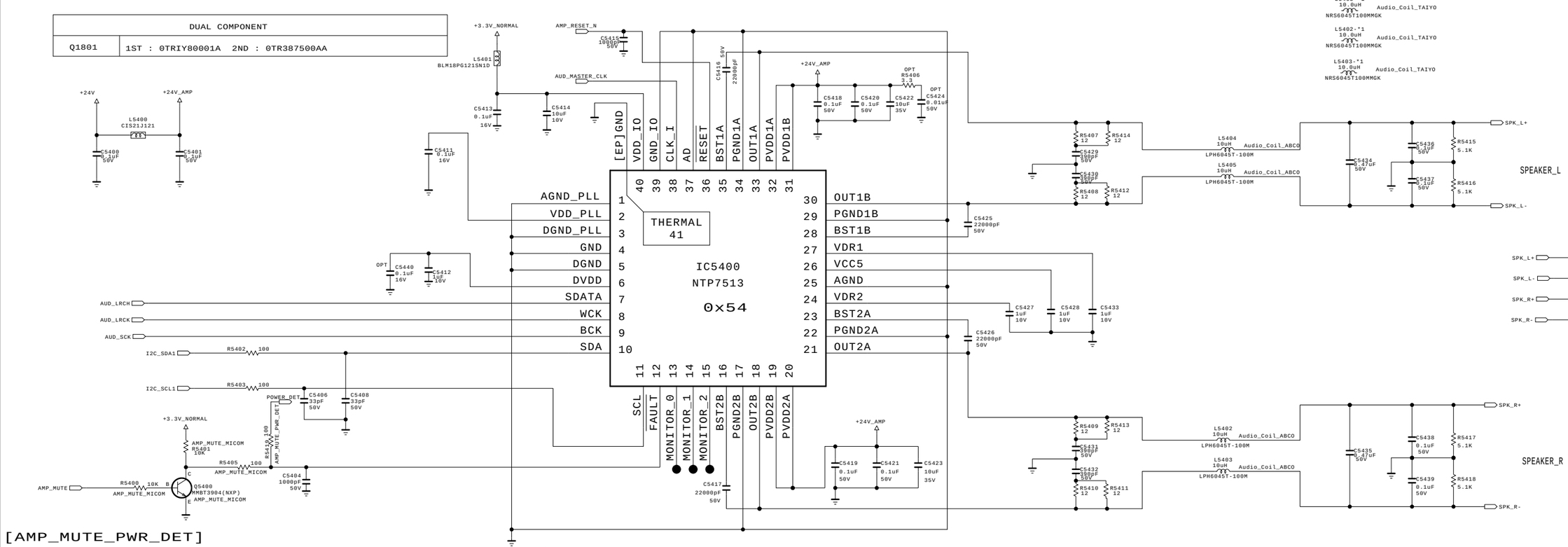
| DUAL COMPONENT | |
|---|---|
| Q1801 | 1ST : 0TRIY80001A 2ND : 0TR387500AA |




[AMP_MUTE_PWR_DET]
 -->For fixing AC-OFF POP noise 32"POLA/ROW model
 -->32"POLA/ROW LPB's 3.5st drop time is very fast

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

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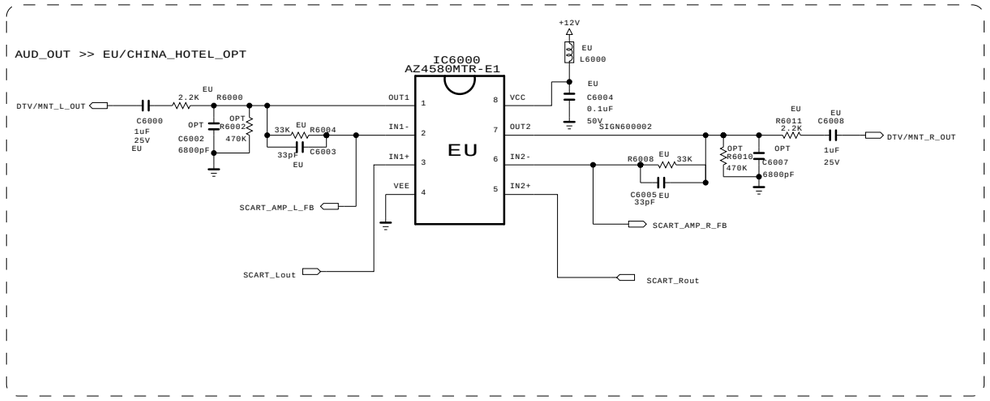


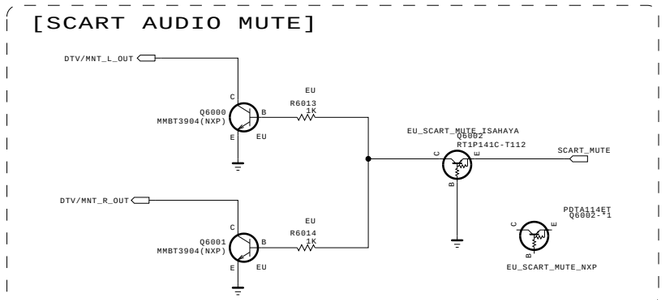


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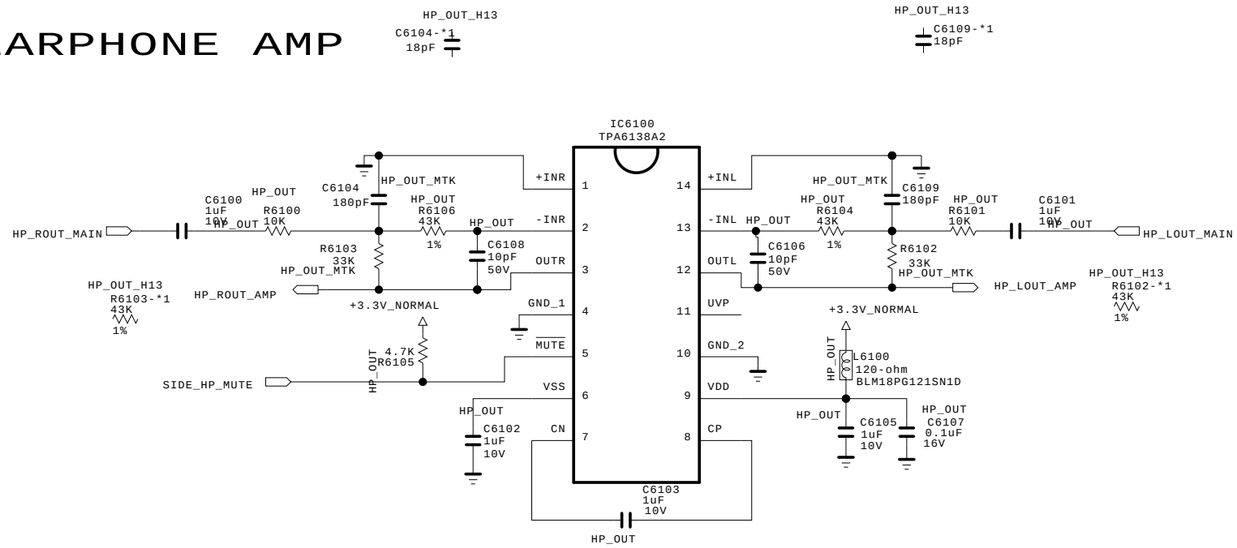
# EARPHONE AMP

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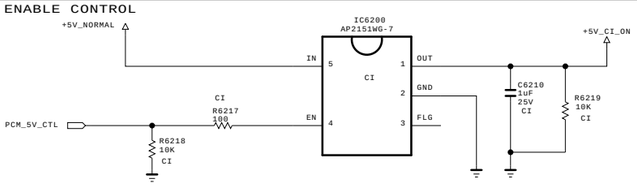
## CI POWER ENABLE CONTROL

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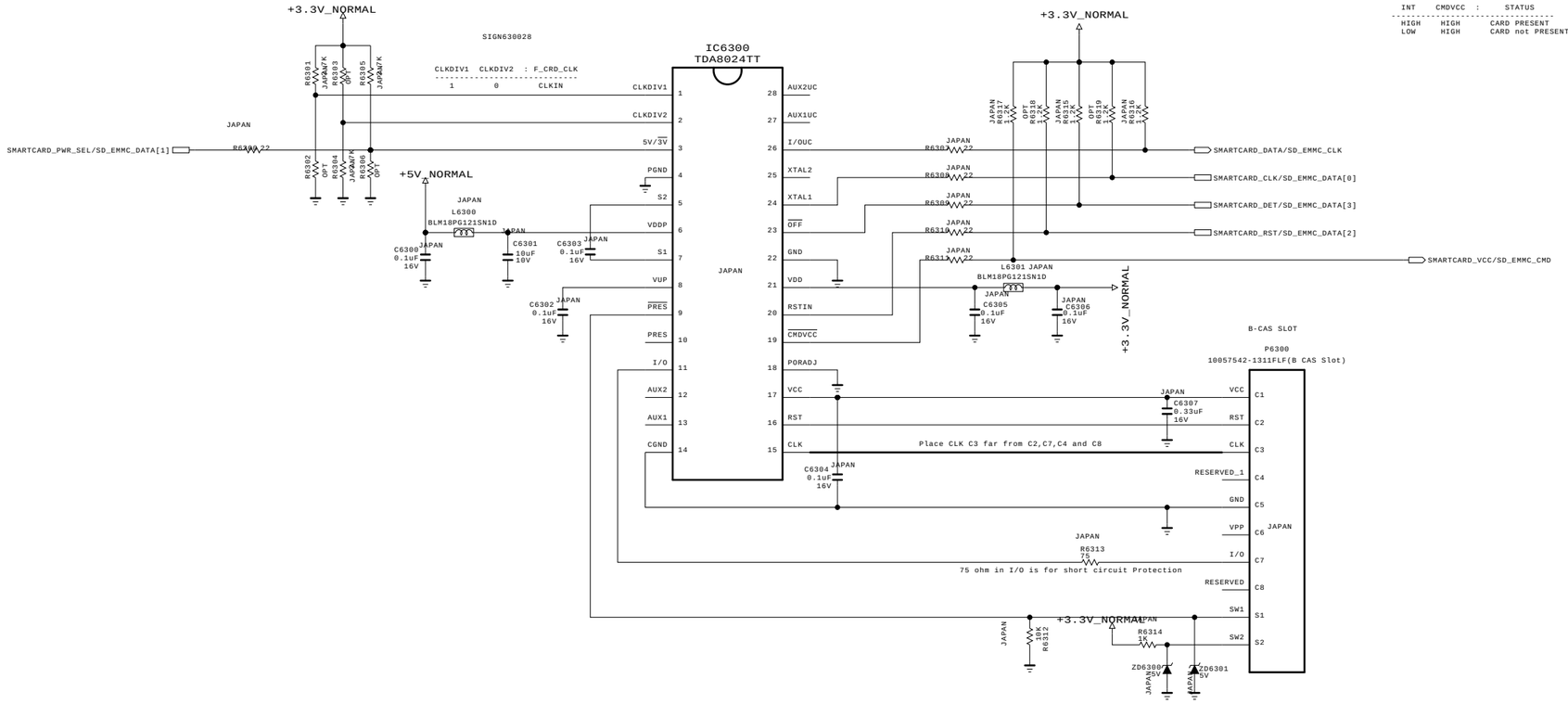
# B-CAS (SMART CARD) INTERFACE

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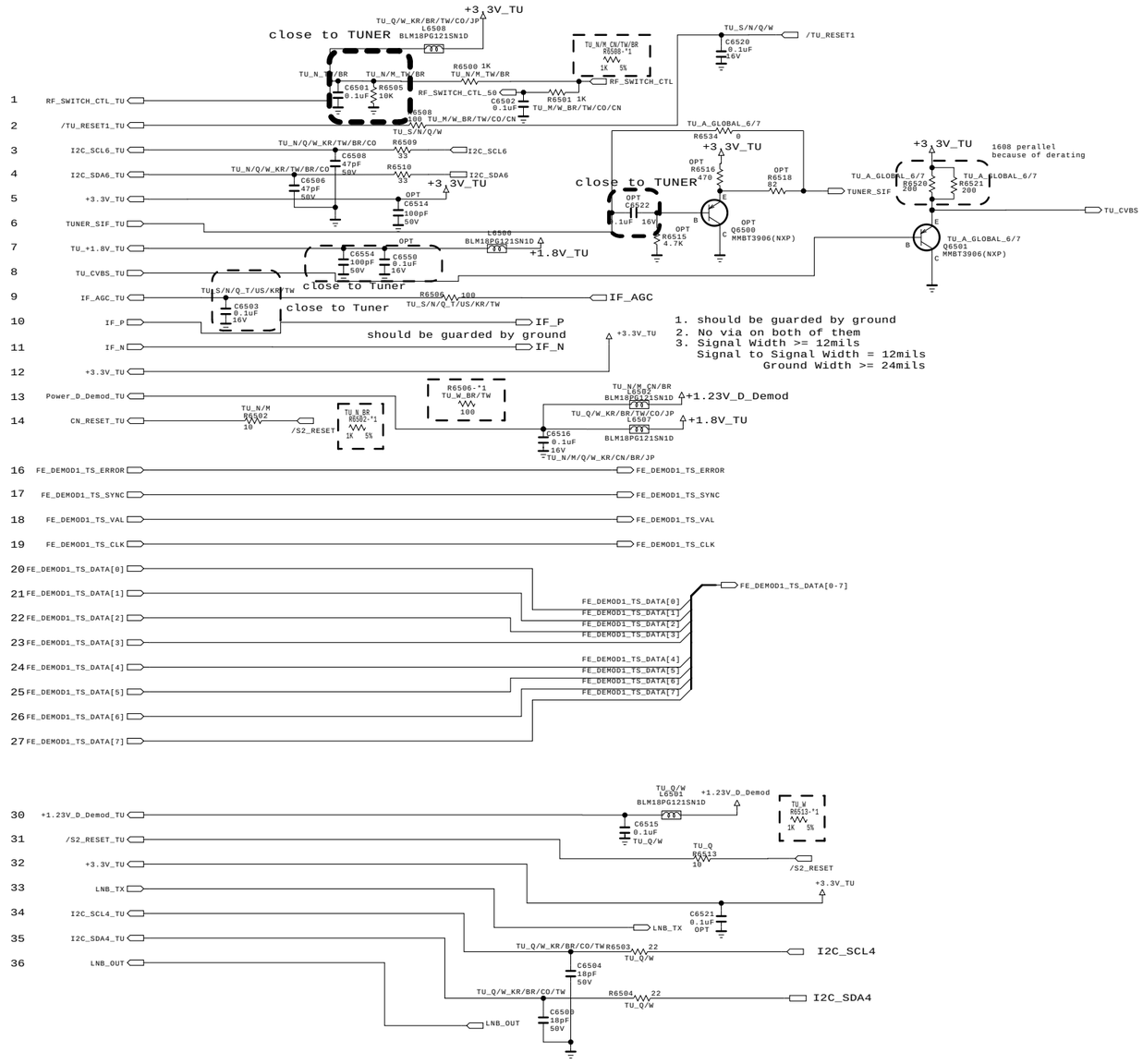

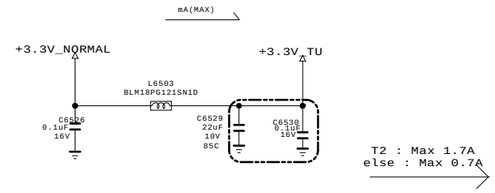


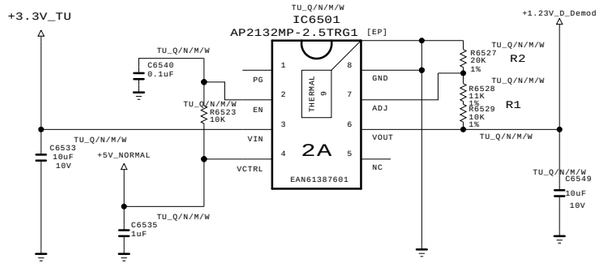


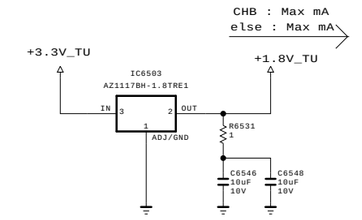


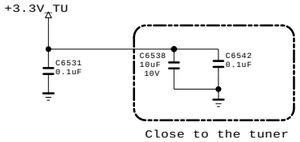


Global F/E Option Name
1. TU
2. Tuner Name = TDS'S',TDS'Q'...
3. Country Name = T,T2,S2,KR,US,BR ...

Example of Option name
TU_Q_T2 = apply TDSQ type tuner and T2 country
TU_M/W = apply TDSM&TDSW Type Tuner

13' Tuner Type for Global
TDS'S'-G501D : T/C Half NIM Horizontal Type
TDS'Q'-G501D : T/C/S2 Combo Horizontal type
TDS'Q'-G601D : T2/C/S2 Combo Horizontal Type
TDS'Q'-G651D : T2/C/S2 Combo Vertical Type
TDS'M'-C601D : China NIM with Isolater Type
TDS'W'-J551F : Japan Dual NIM

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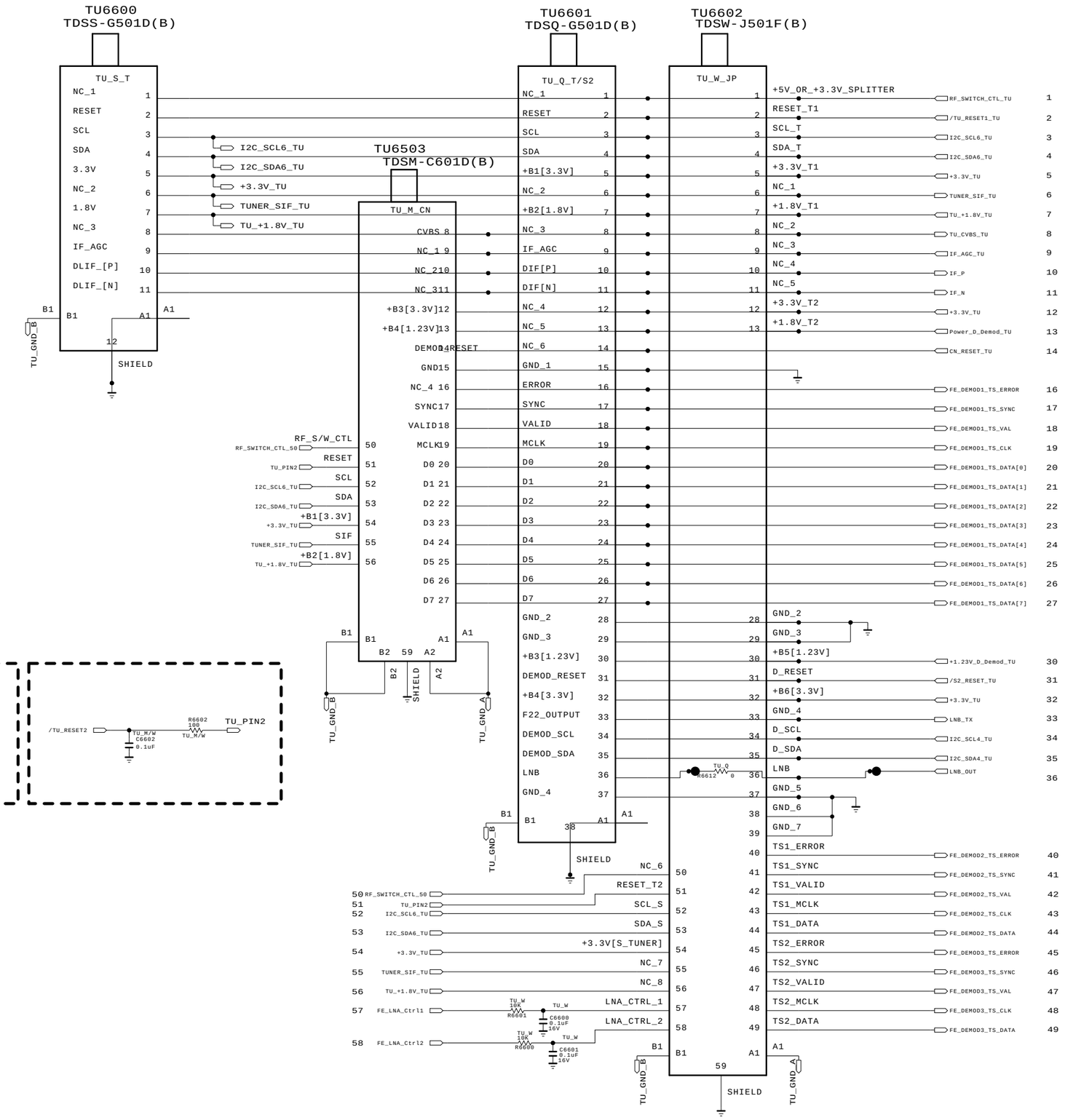


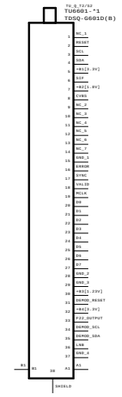

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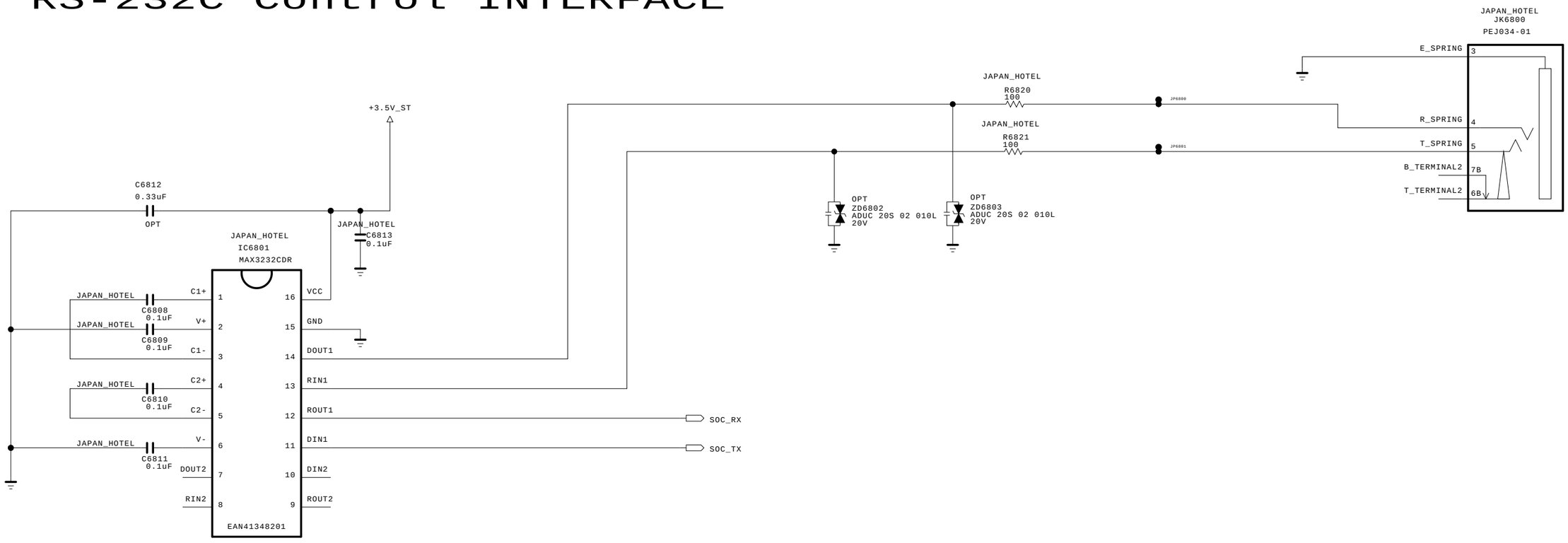
# RS-232C Control INTERFACE

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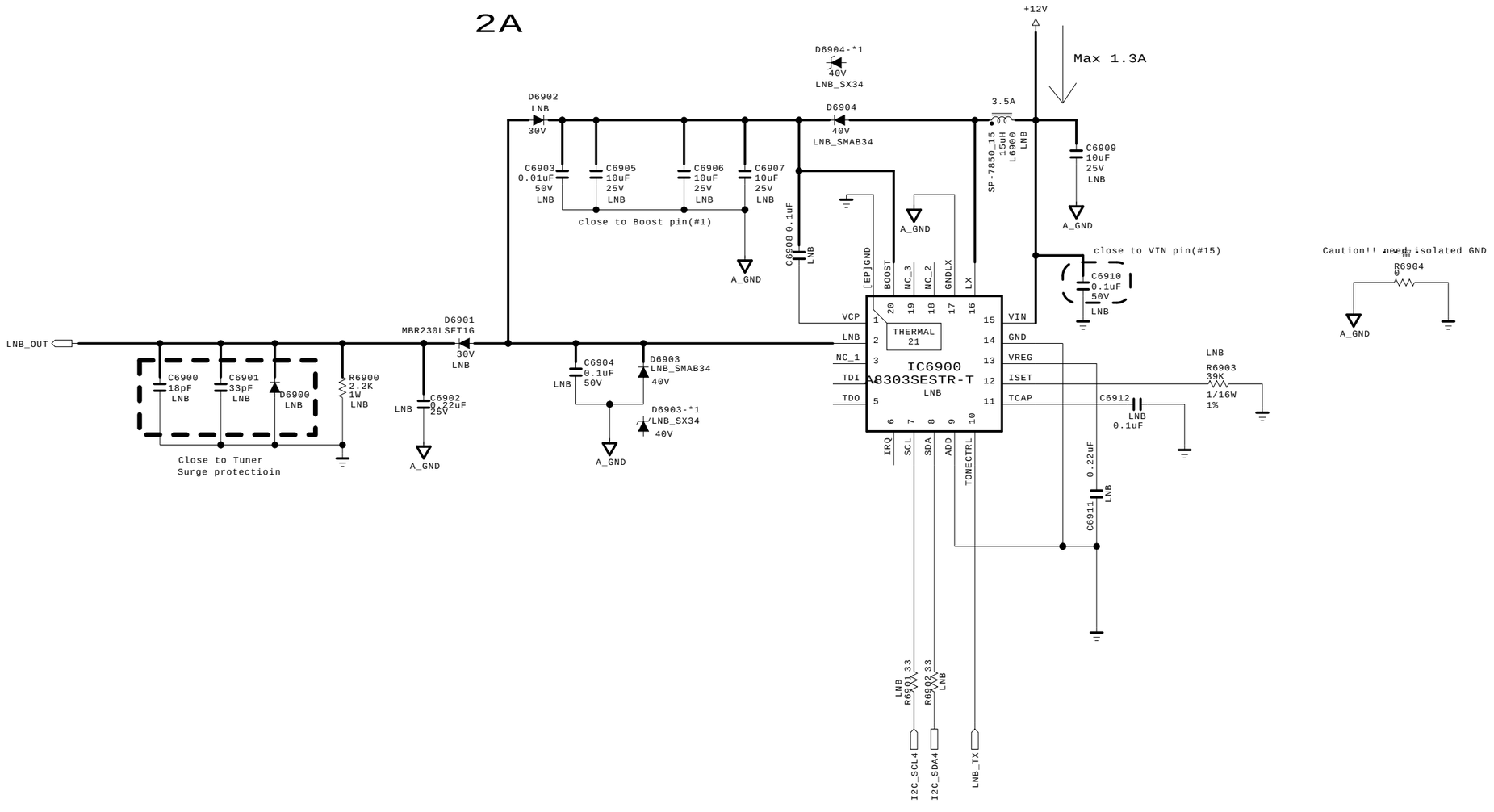
# DVB-S2 LNB Part Allegro

(Option:LNB)

3A

Input trace widths should be sized to conduct at least 3A
Ouput trace widths should be sized to conduct at least 2A

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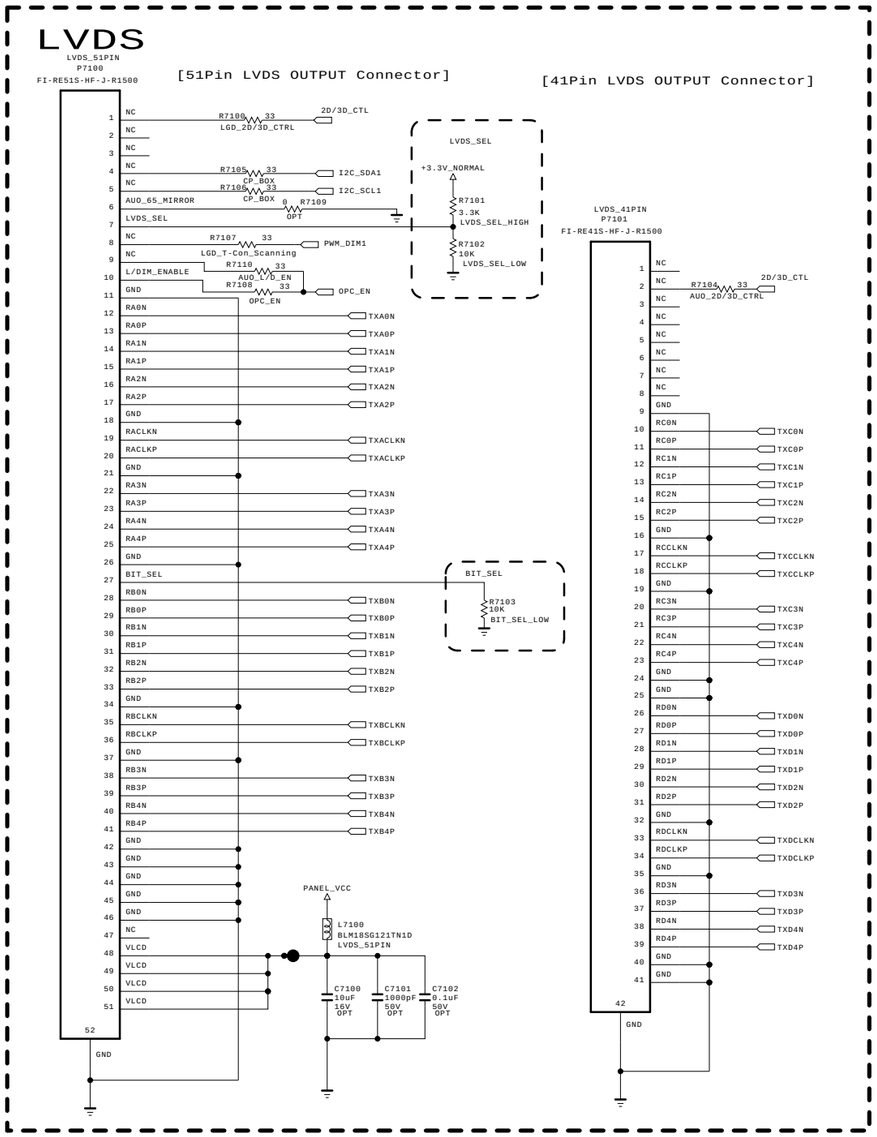
# LVDS

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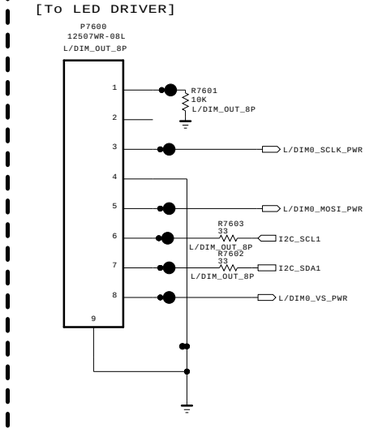
# LOCAL DIMMING

[To LED DRIVER]

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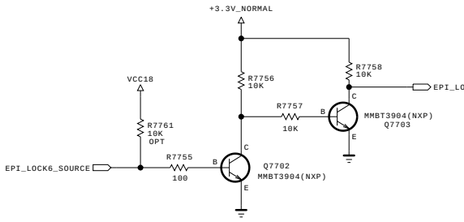
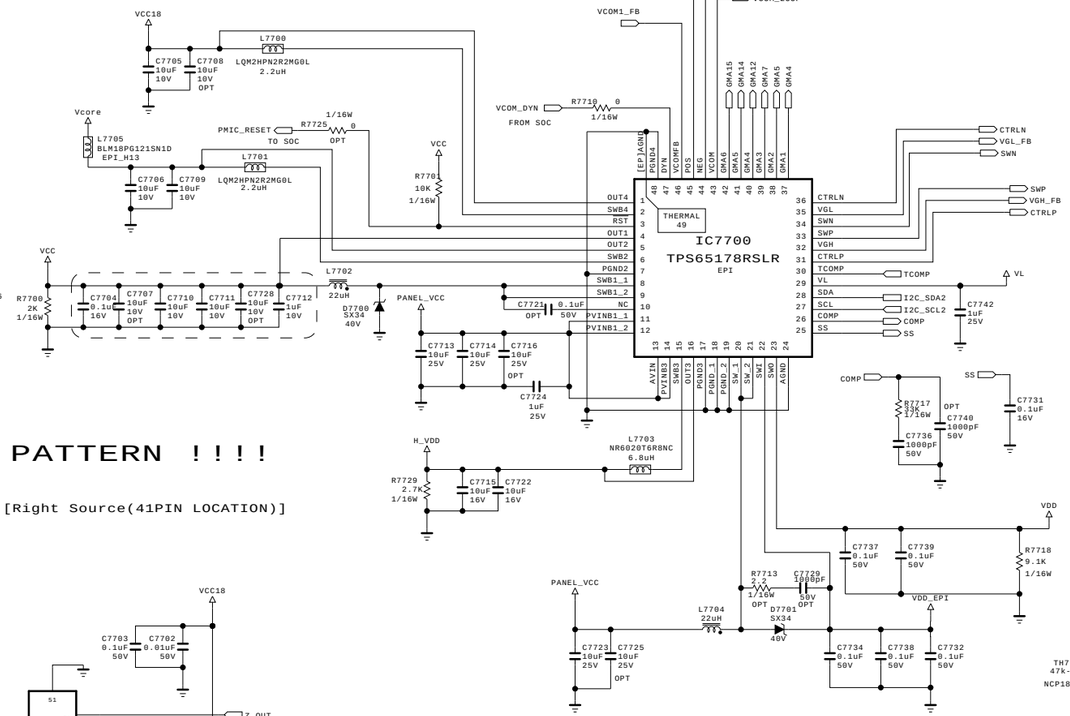
# <POWER BLOCK>

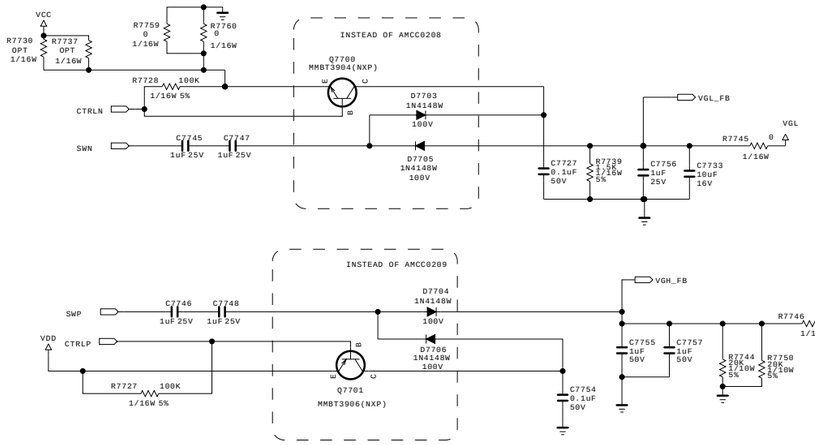


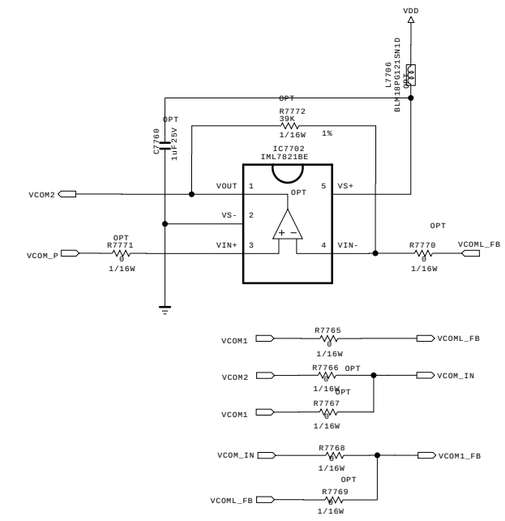

THIS IS REVERSE PATTERN !!!!

[Left Source(51PIN LOCATION)]

[Right Source(41PIN LOCATION)]

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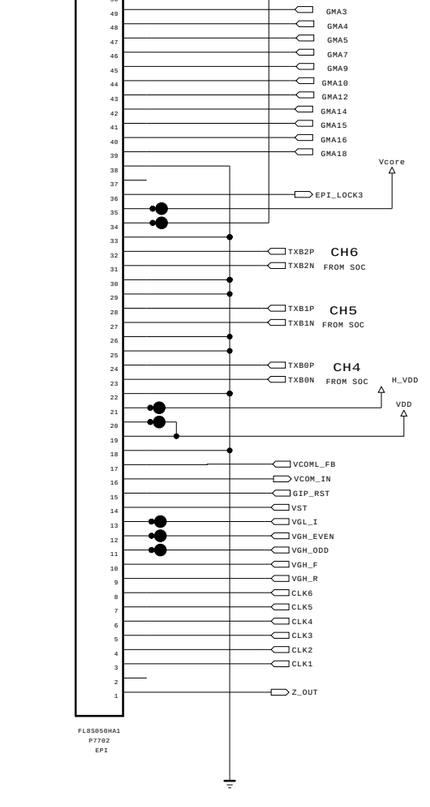


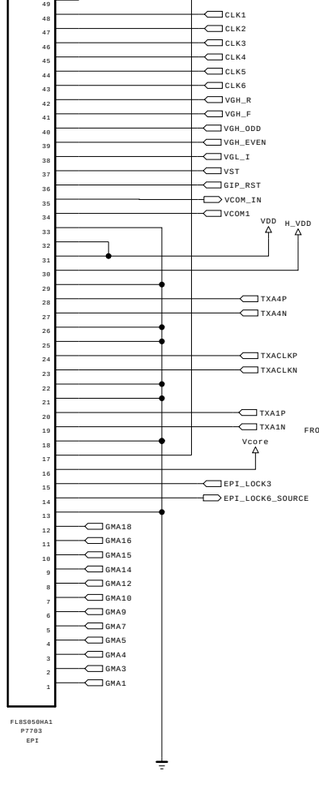


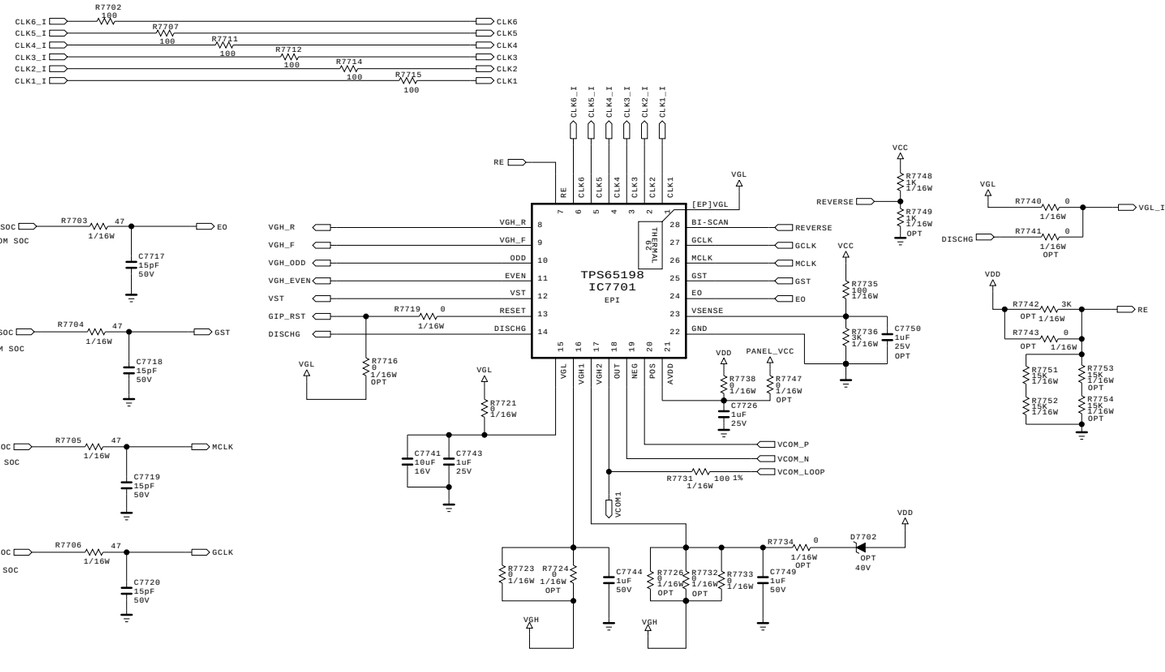


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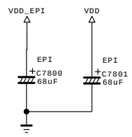


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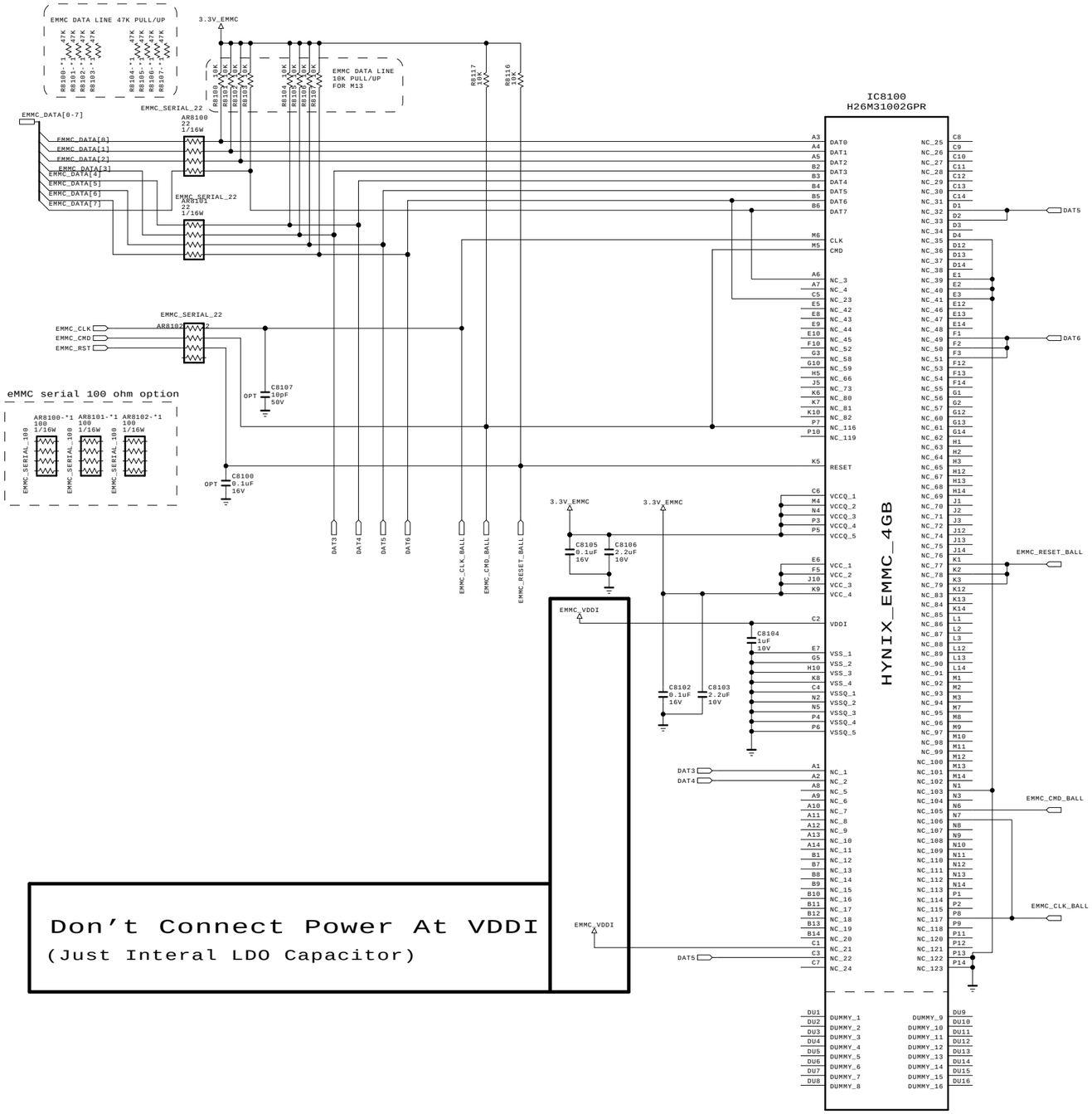
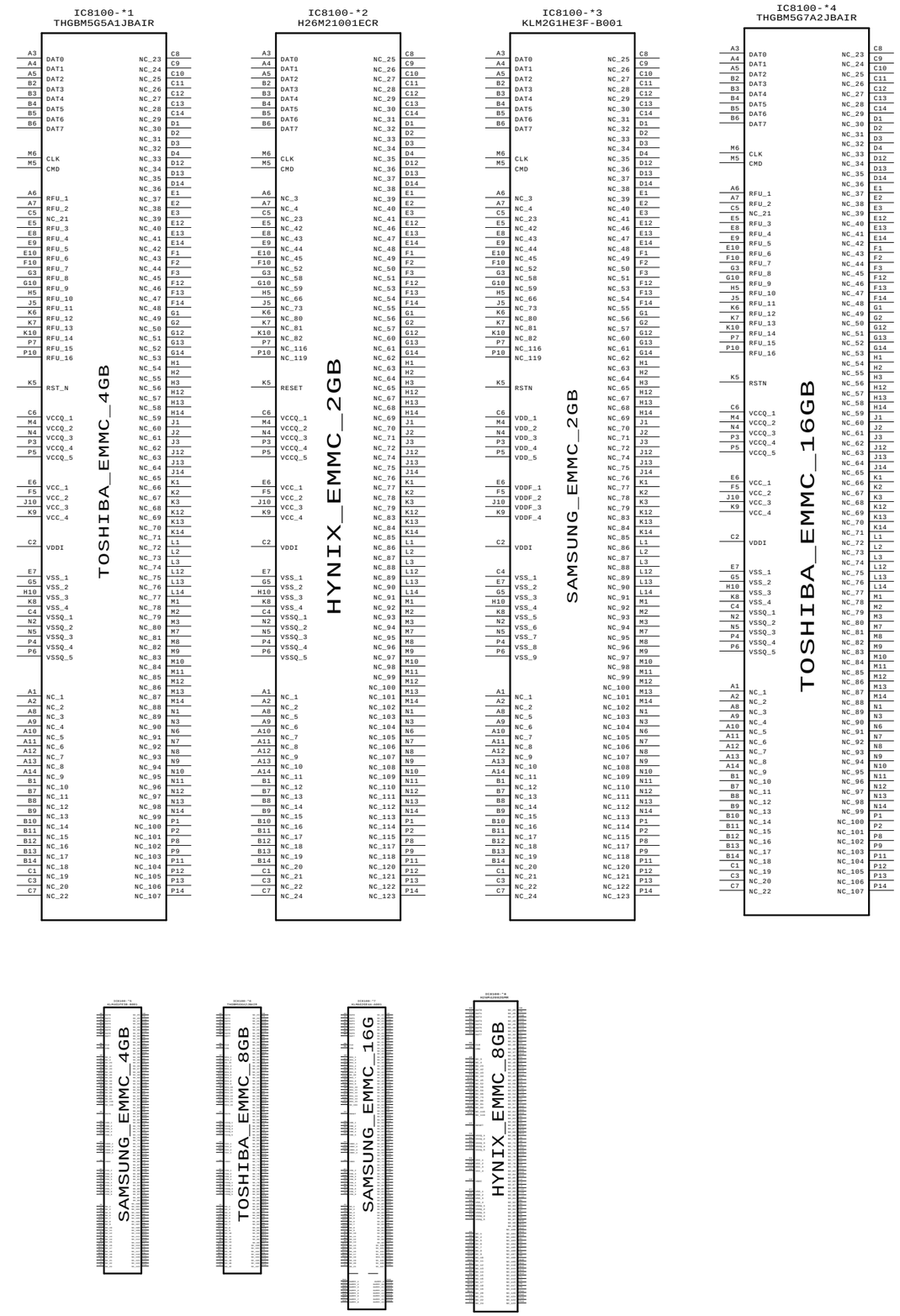
# eMMC I/F




Don’t Connect Power At VDDI
(Just Interal LDO Capacitor)

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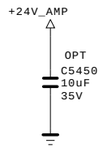


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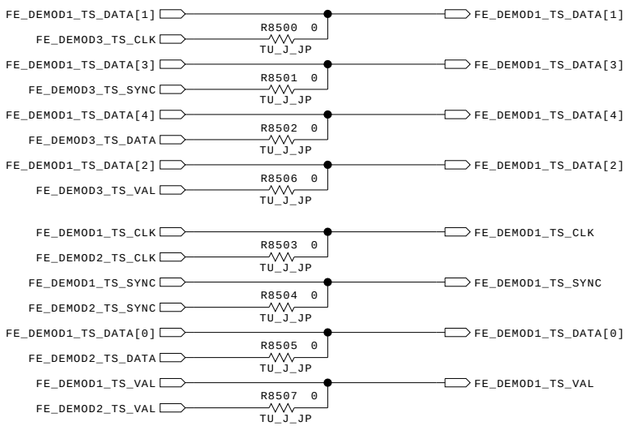
# JAPAN TUNER INTERFACE




USE Two serial TS Port for Japan : MTK

| A2 Ball Name | Function |
|---|---|
| DEMOD_TSCLK | Ext_TS_CLK |
| DEMOD_TSSYNC | Ext_TS_Sync |
| DEMOD_TSDATA0 | Ext_Ts_D0 |
| DEMOD_TSVAL | Ext_Ts_VAL |
| DEMOD_TSDATA1 | EXT2_Ts_CLK |
| DEMOD_TSDATA3 | EXT2_TS_Sync |
| DEMOD_TSDATA4 | EXT2_TS_D0 |
| DEMOD_TSDATA2 | EXT2_TS_Val |

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LG
Life's Good

# 2013 LED/LCD TV
# Engineering guide

**< Applicable Model : Mid-end Platform >**

**XXLA74*-Z***
**XXLA71*-Z***
**XXLA69/66*-Z***
**XXLA64/62/61*-Z***
**XXLN57*-Z***

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# ◈ CONTENT ◈

1. New features
2. Main PCBs
3. Block Diagrams, IIC Map
4. Structure of TV set and connection of sub ass'ys
5. New sub ass'ys
   - Instruction of new sub ass'ys
6. Adjust way of new features
7. Repair guide

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# EPI Interface

- EPI(Embedded Point-Point Interface)
- Features
  - **Point-Point topology (support 2 Pair option)**
  - **CDR (Clock Data Recovery)**
  - **Bandwidth up to 1.85Gbps/pair at FHD 120Hz 10 bit application**
  - **Lock signal cascading and feedback to T-Con**
  - **Embedded Control Data**
- Merits
  - **Better reliability on common noise**
  - **No data skew and better EMI margin**
  - **Fewer lines than mini-LVDS**
  - **Slim PCB design**

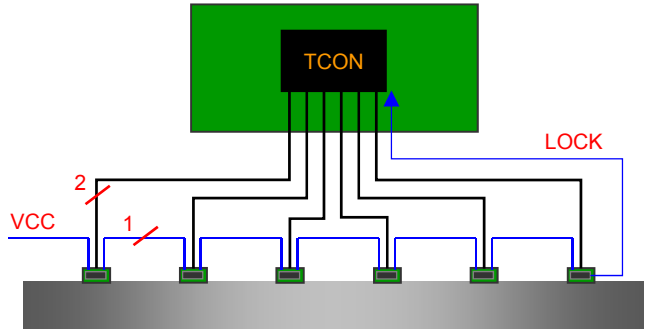


**Figure1. Topology**

**Table 1. Example of FHD 120Hz TV**

| EPI | FHD (10bit) @ 960Ch | | |
|---|---|---|---|
| | 60Hz | 120Hz | 240Hz |
| Transmission Line | 12 | 12 | 24 |
| Bandwidth | 0.84Gbps | 1.68Gbps | 1.68Gbps |

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# EPI Interface (mini-LVDS vs. EPI)

## Comparison

### HF mini-LVDS

| HF mini-LVDS | FHD (10bit) | | |
|---|---|---|---|
| | 60Hz | 120Hz | 240Hz |
| No. of Signal | 36 | 36 | 72 |
| Connector | 60pin (2ea) | 60pin (2ea) | 80pin (2ea) |

-Difficult to upgrade bandwidth limit
-Multiple number of wires needed for higher bandwidth

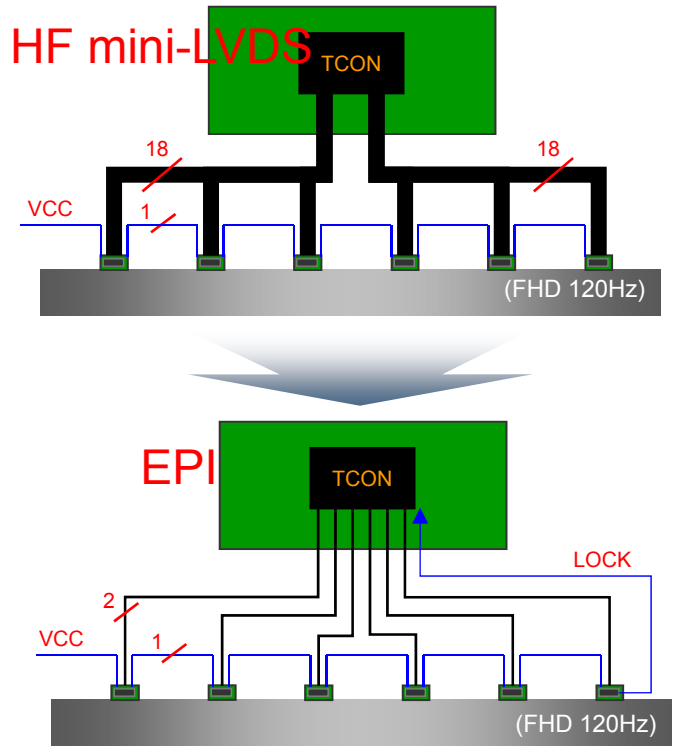
### EPI (Embedded clock P-to-P Interface)

| EPI | FHD (10bit) | | |
|---|---|---|---|
| | 60Hz | 120Hz | 240Hz |
| | 960ch | 960ch | 720ch |
| No. of Signal | 12 | 12 | 32 |
| Connector | - | 50 pin (2ea) | 70pin (2ea) |

-Better reliability on common noise
-No data skew. Better EMI margin
-Lower cost ( Cable, Connector )
-Slim S-PCB design (14mm → 10mm) helps slimmer TV

## What to change

### LCM (T-con to S-Driver IC)




* Bandwidth Capability
- FHD 120Hz 10Bit : 594Mbps@36Lines → 1.65Gbps@12Lines
- FHD 240Hz 10Bit : 594Mbps@72Lines → 1.25Gbps@32Lines

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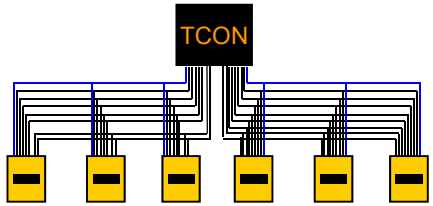
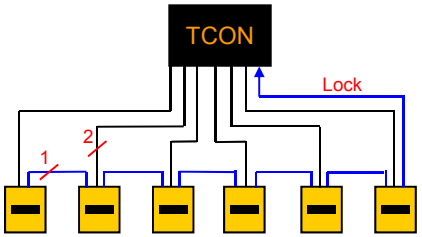
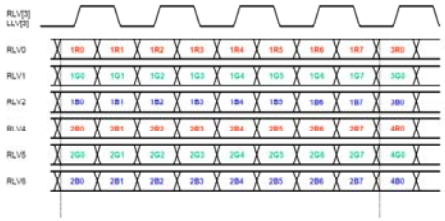
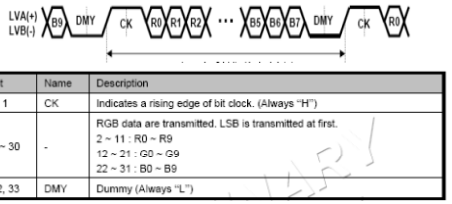
# EPI Interface (mini-LVDS vs. EPI)

| | HF mini-LVDS | EPI |
|---|---|---|
| **Topology** |  |  |
| **Protocol** |  |  <br>Bit / Name / Description<br>0, 1 / CK / Indicates a rising edge of bit clock. (Always "H")<br>2 ~ 30 / - / RGB data are transmitted. LSB is transmitted at first.<br>2 ~ 11 : R0 ~ R9<br>12 ~ 21 : G0 ~ G9<br>22 ~ 31 : B0 ~ B9<br>32, 33 / DMY / Dummy (Always "L") |
| **Features @10bit, FHD120** | • Multi Drop<br>• Data rate: 660Mbps<br>• External clock | • Point to Point<br>• Data rate : 1.8Gbps<br>• Embedded clock, Control |
| **Merit** | • Simple structure<br>• Standardization | • Fewer Lines : 12<br>• Embedded clock<br>: low EMI, Clock skew free<br>• Easy to PCB design |
| **Demerit** | • Too many lines : 36<br>• Clock skew<br>• EMI due to clock lines<br>• Bandwidth limit | • Transmission Overhead<br>: 4bit delimiter |

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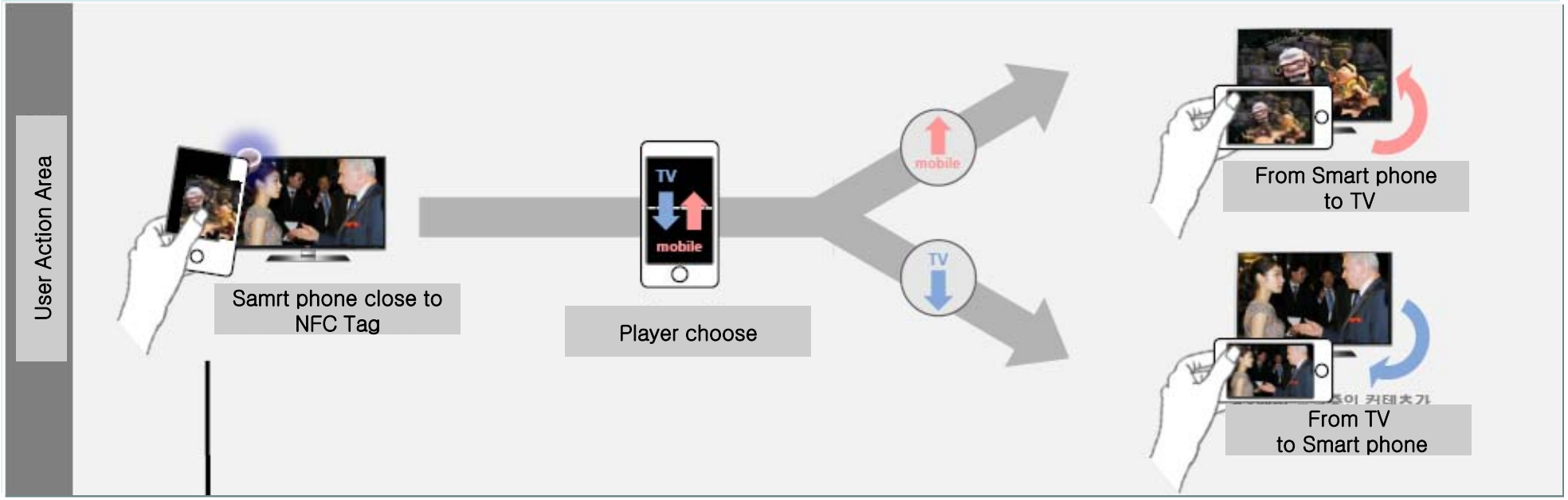
# NFC (Near field communication)

**Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimetres. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi. Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag".**




## Tag On

Touch the smartphone to the Tag On sticker.

- Using an LG smartphone with the NFC and Miracast functions, you can:
  - TV to Phone: run the LG TV Remote app on the smartphone.
  - Phone to TV: view the screen of the smartphone on the TV.

  To end the connection, touch the smartphone to the Tag On sticker again.
  (You can also disable the Miracast function on the smartphone.)

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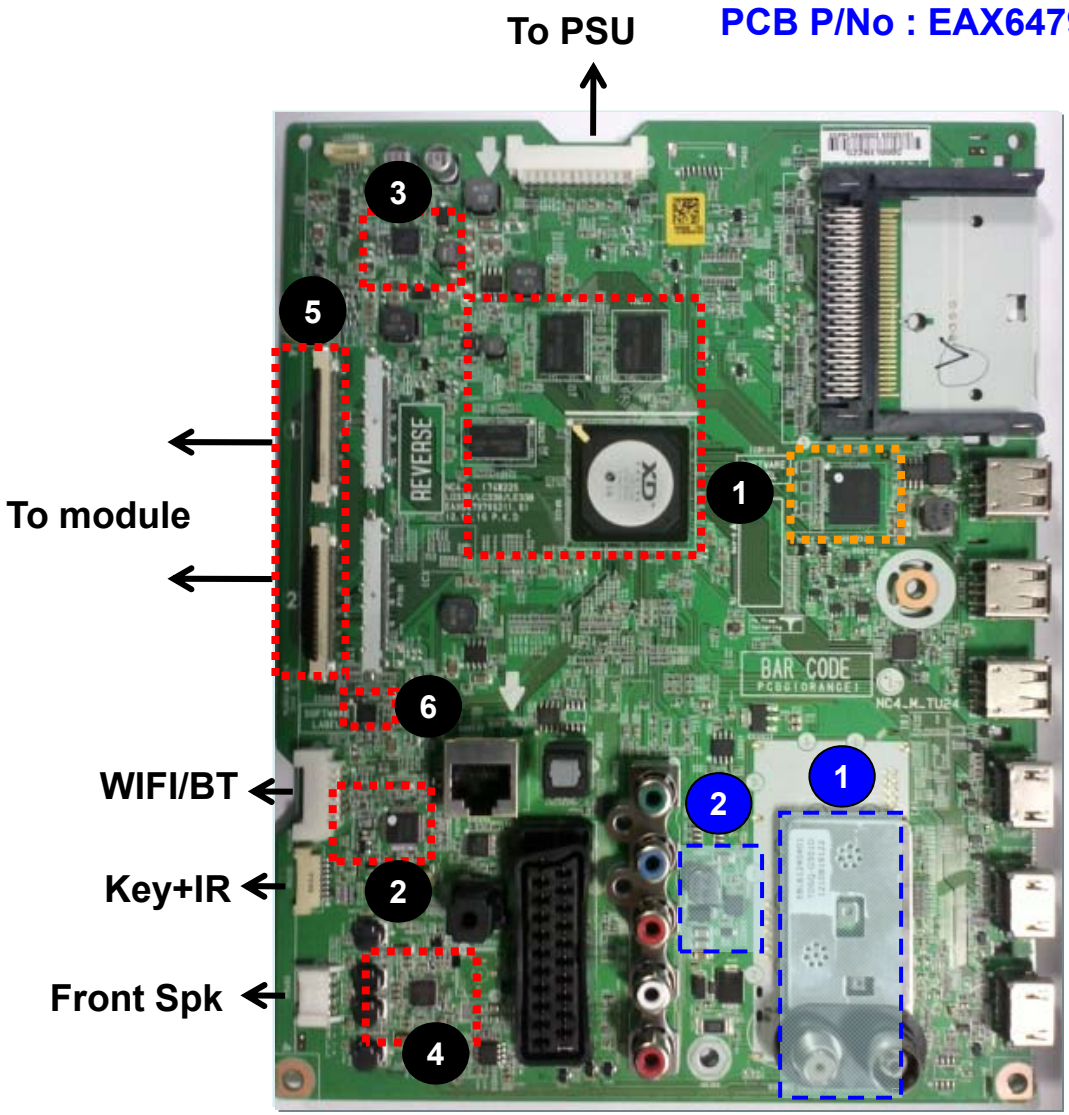
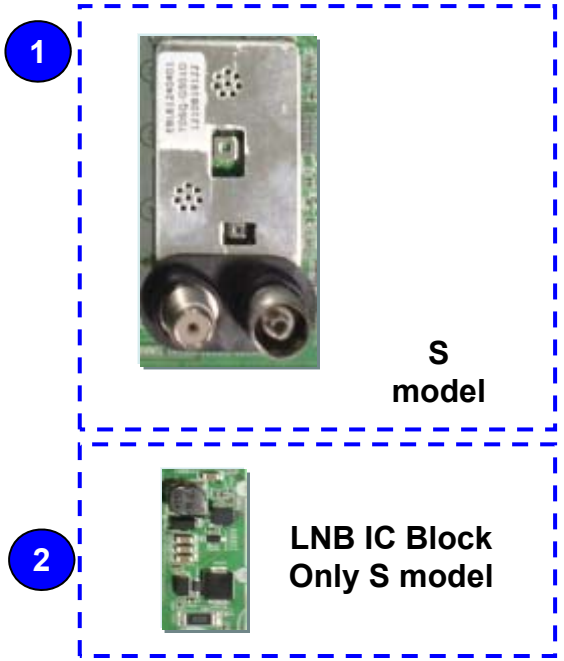
# Main PCB for Broadband

## xxLA660S-Zx

**Chassis : LD33B**
**PCB P/No : EAX64797003**




**Main + TCON all in one**




1. Main processor, DDR Memory eMMC Memory
2. Micom for Key/IR sensing
3. PMIC
4. Audio AMP
5. EPI Wafer
6. Level shifter

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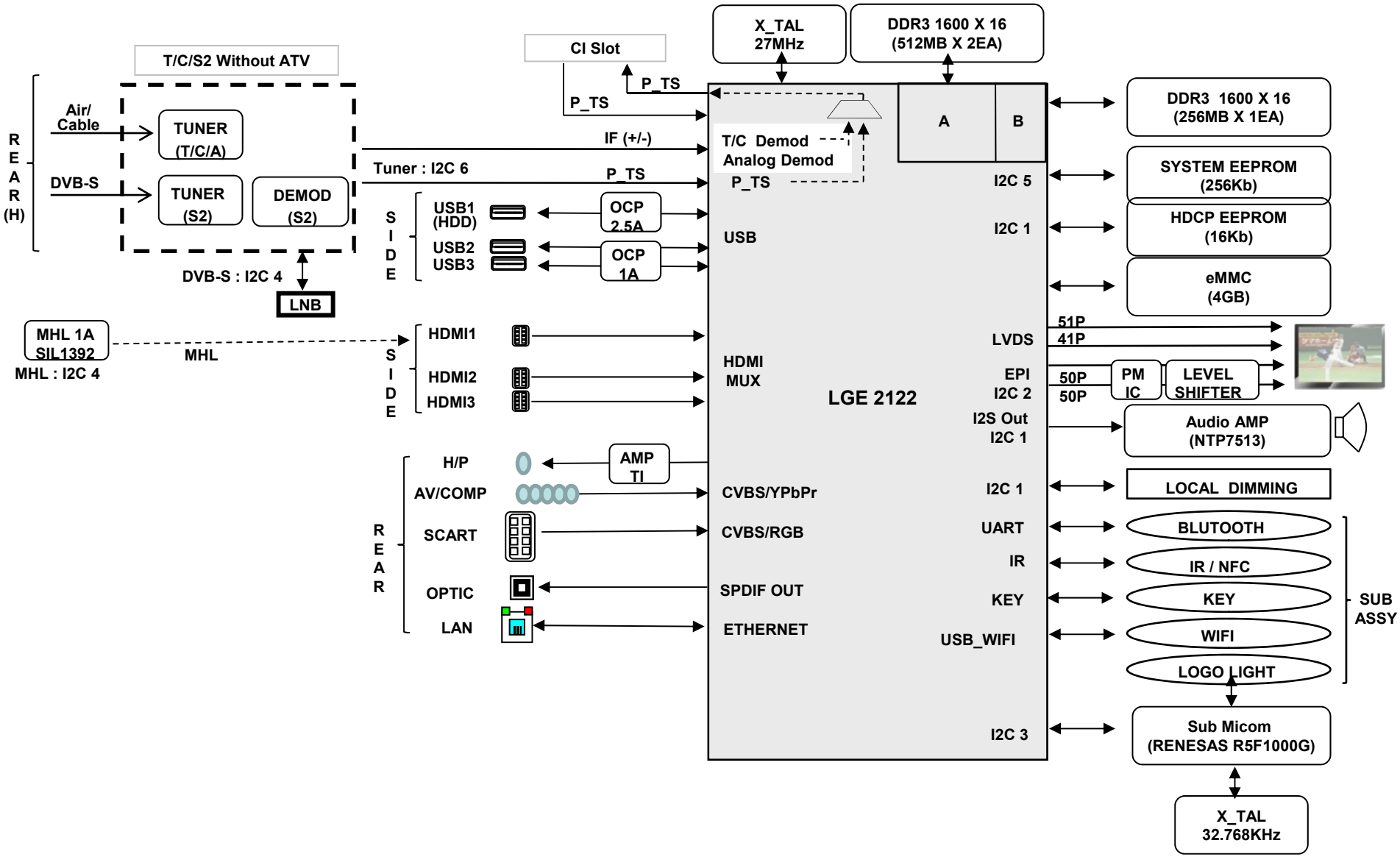
# 1. LGE2122 Block Diagram

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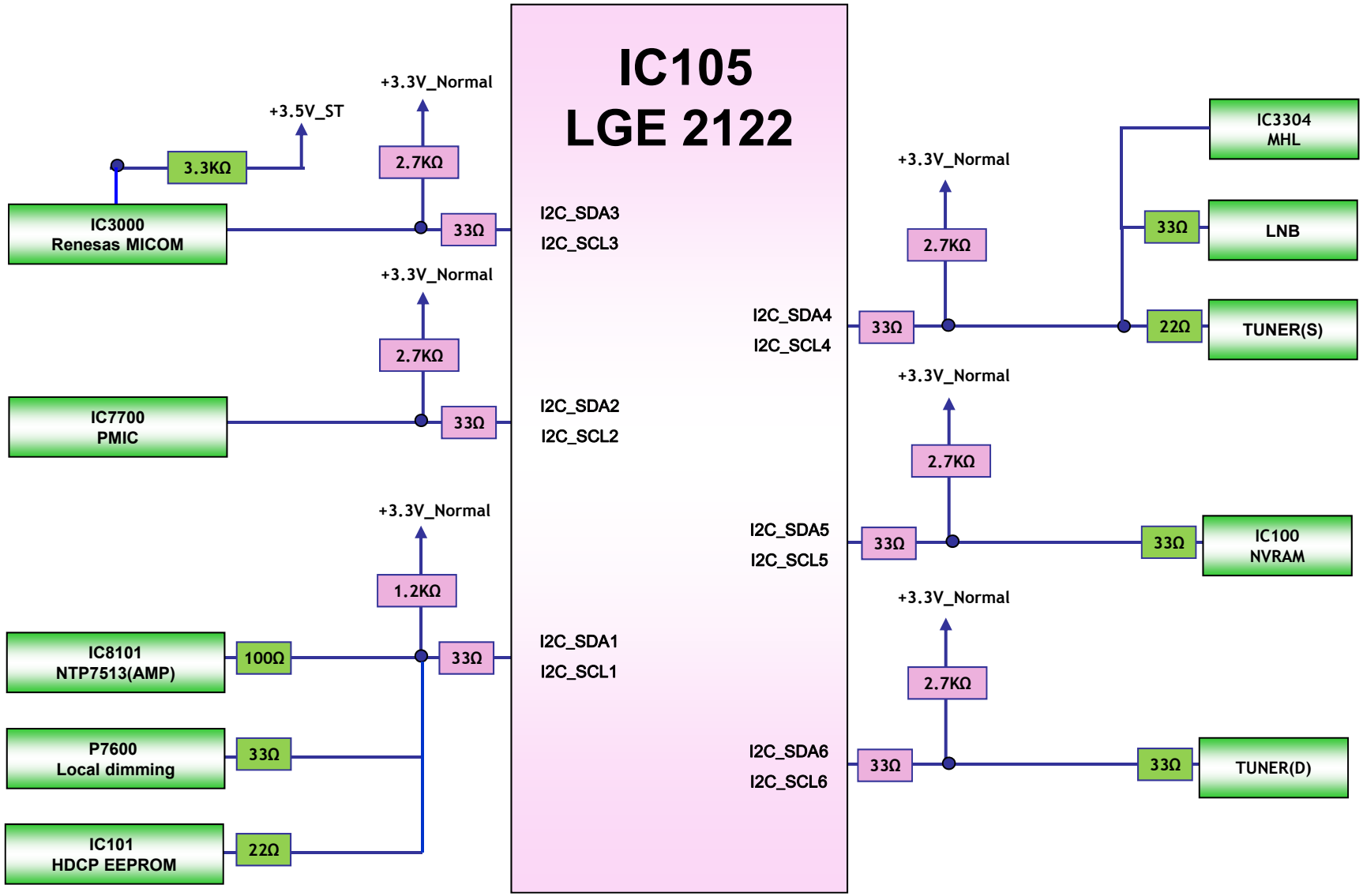
# 2. LGE 2122 I2C Block Diagram

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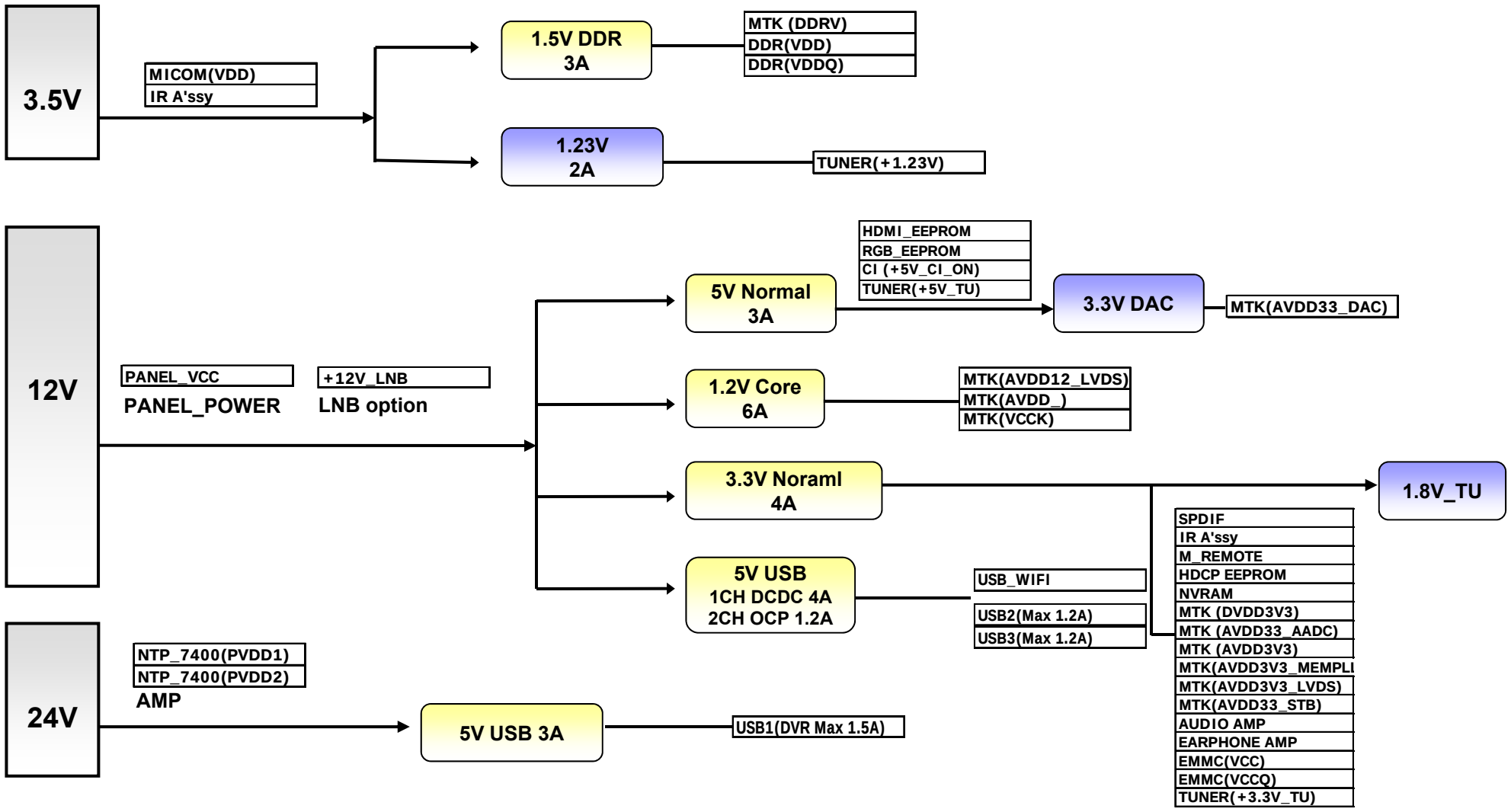
# 3. Power Block Diagram

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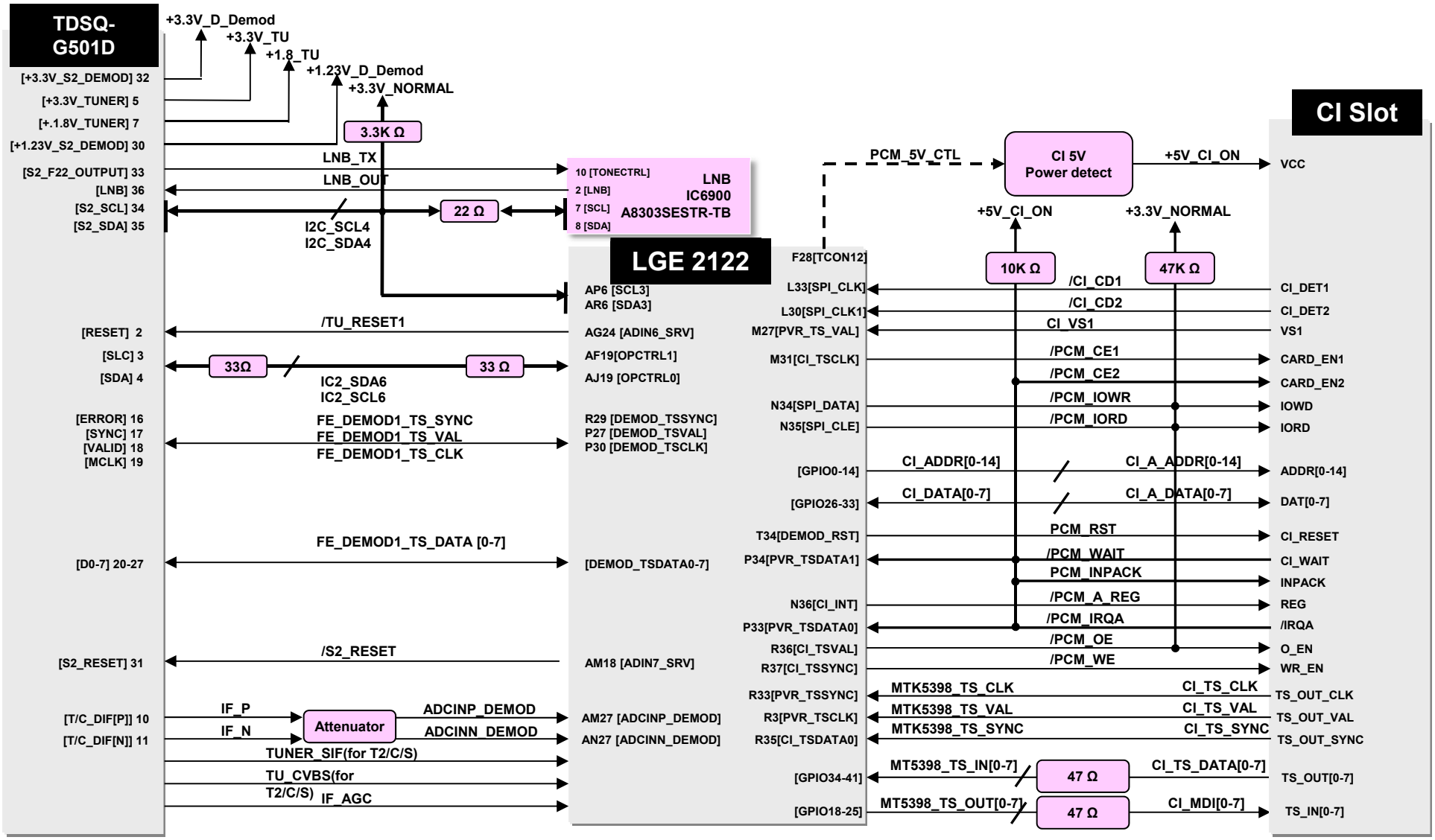
# 4. Tuner/CI Block Diagram

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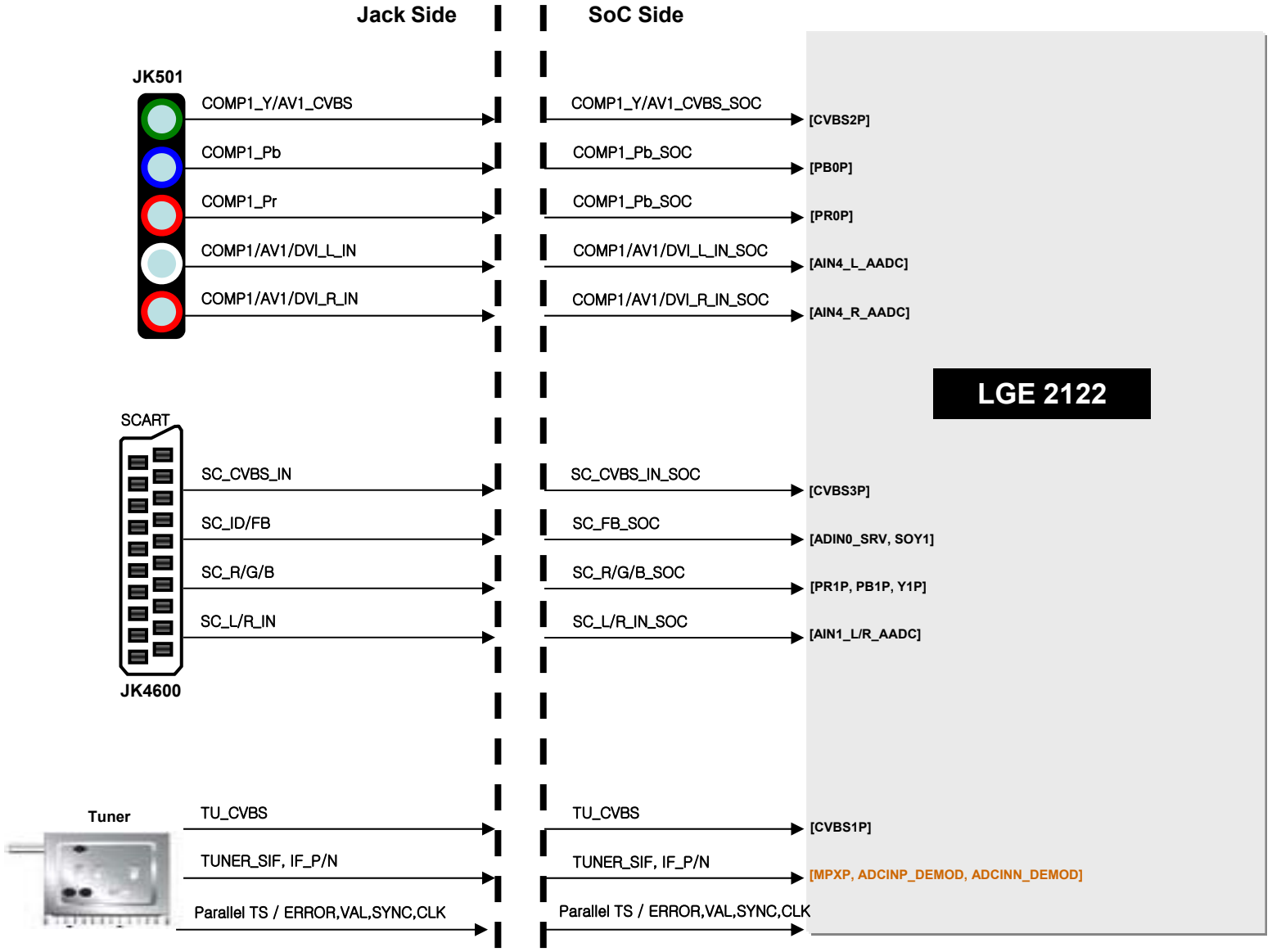
# 5. Video/Audio In Block Diagram

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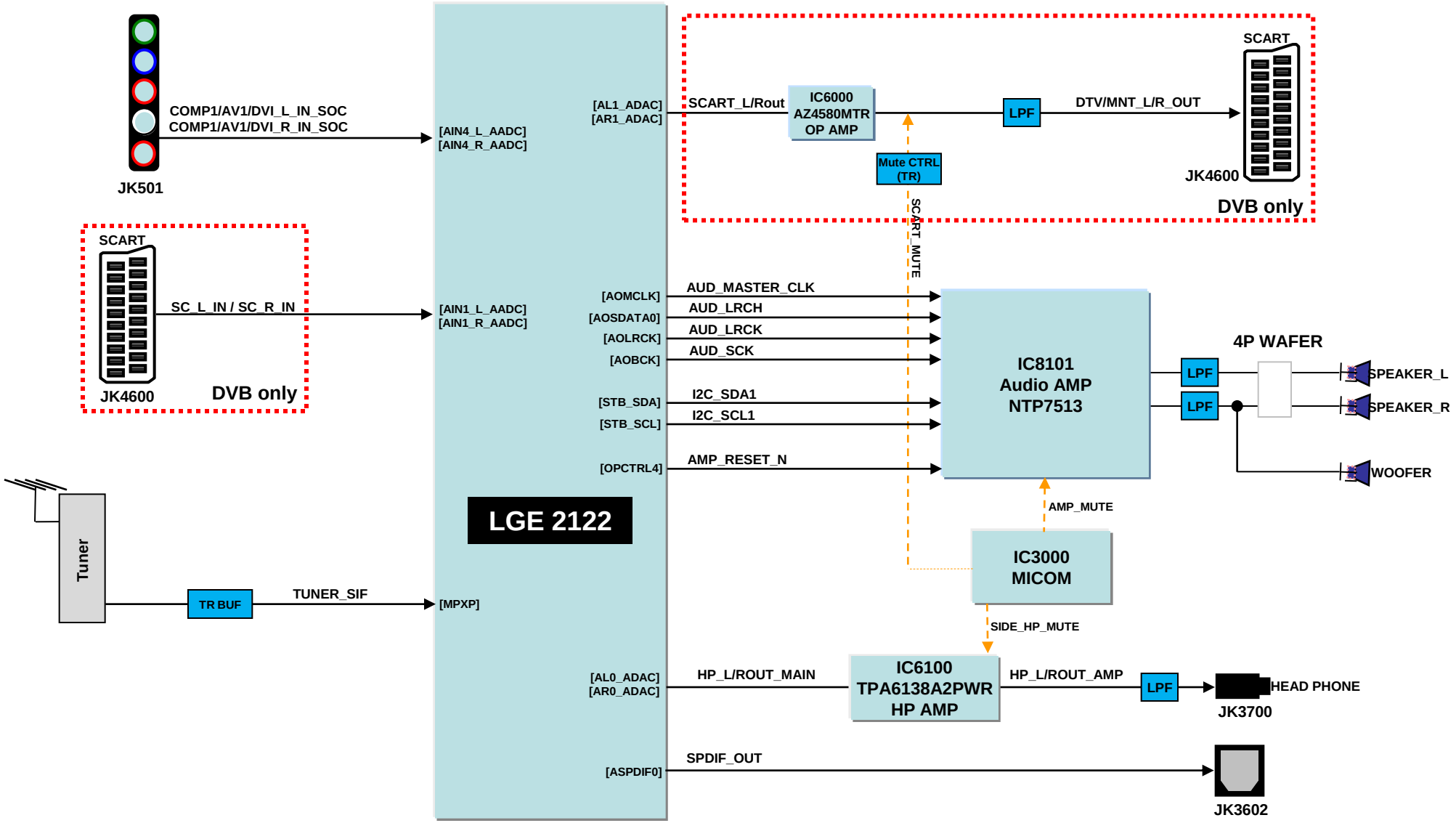
# 6. Audio Out Block Diagram

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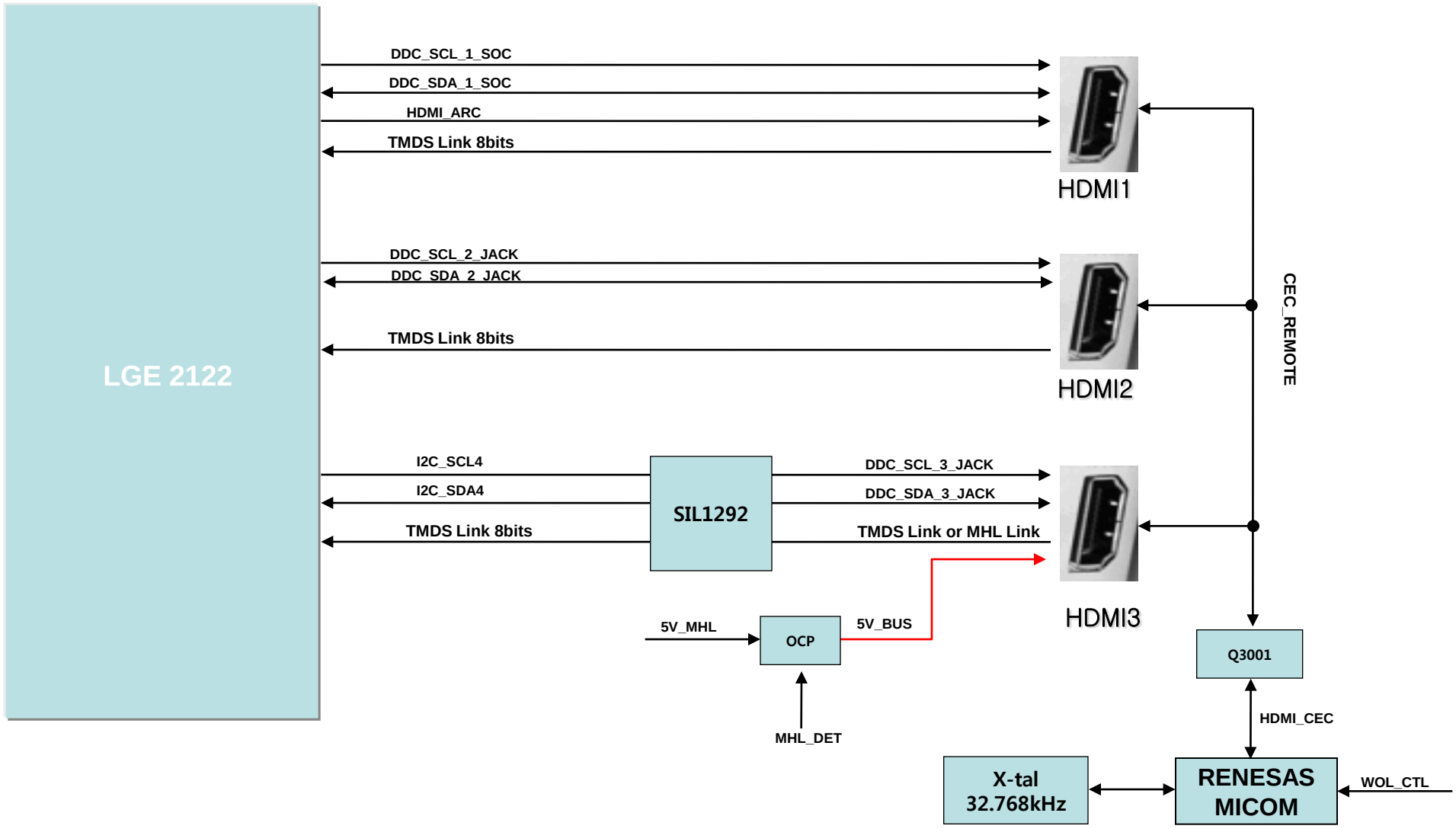
# 7. HDMI

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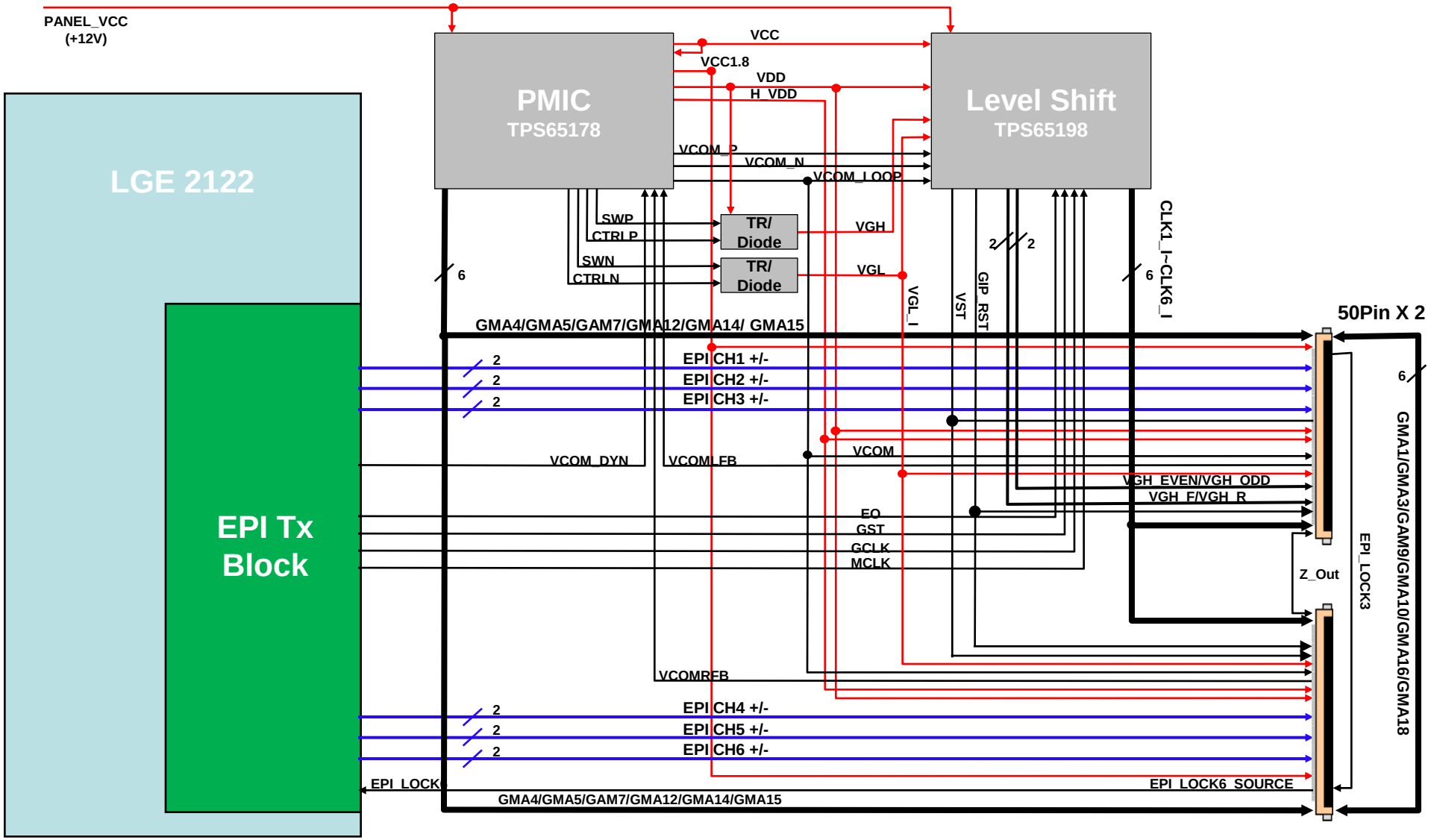
# 8. Panel Interface Block Diagram

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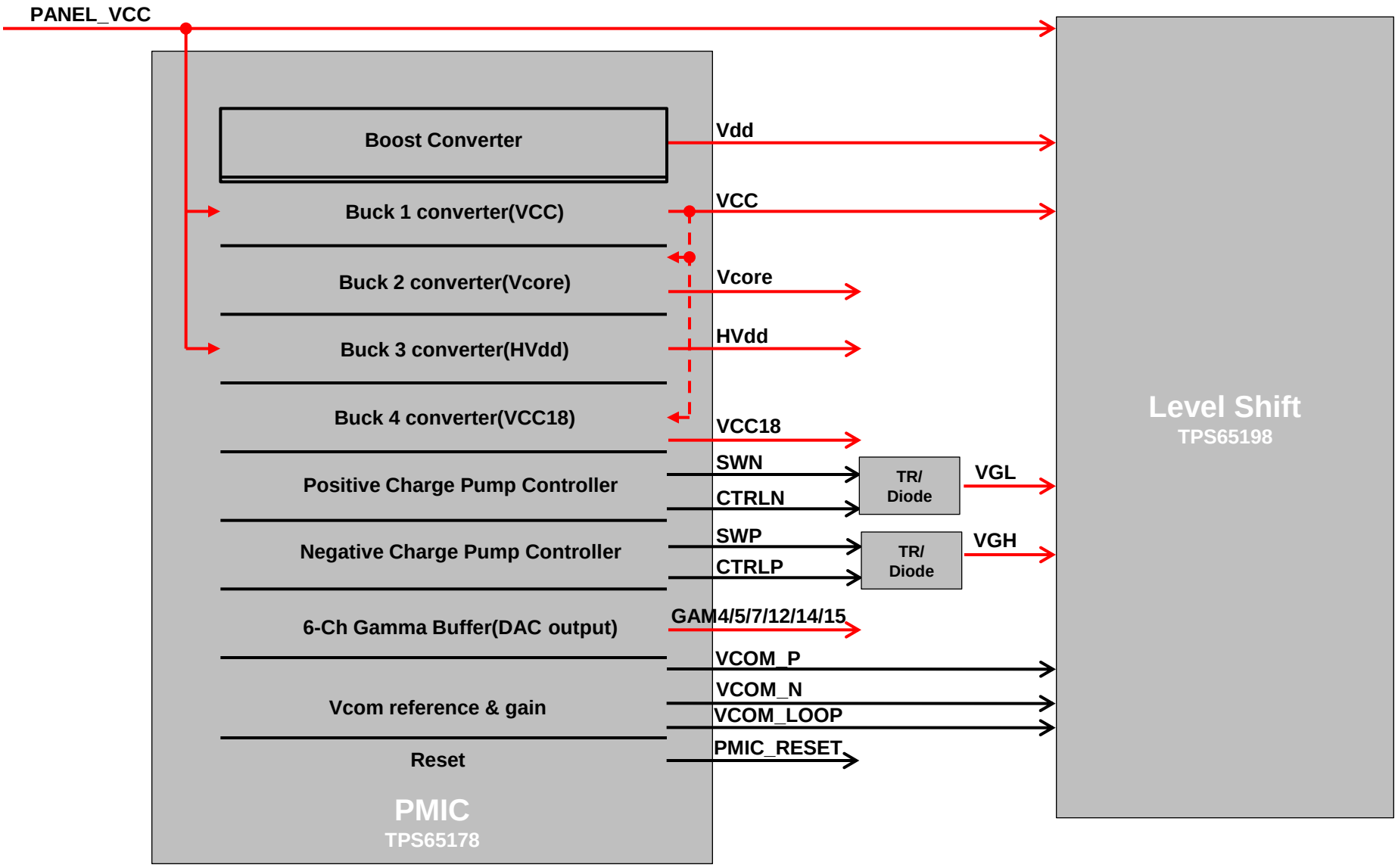
# 9. PMIC & Level Shift Bloc Diagram

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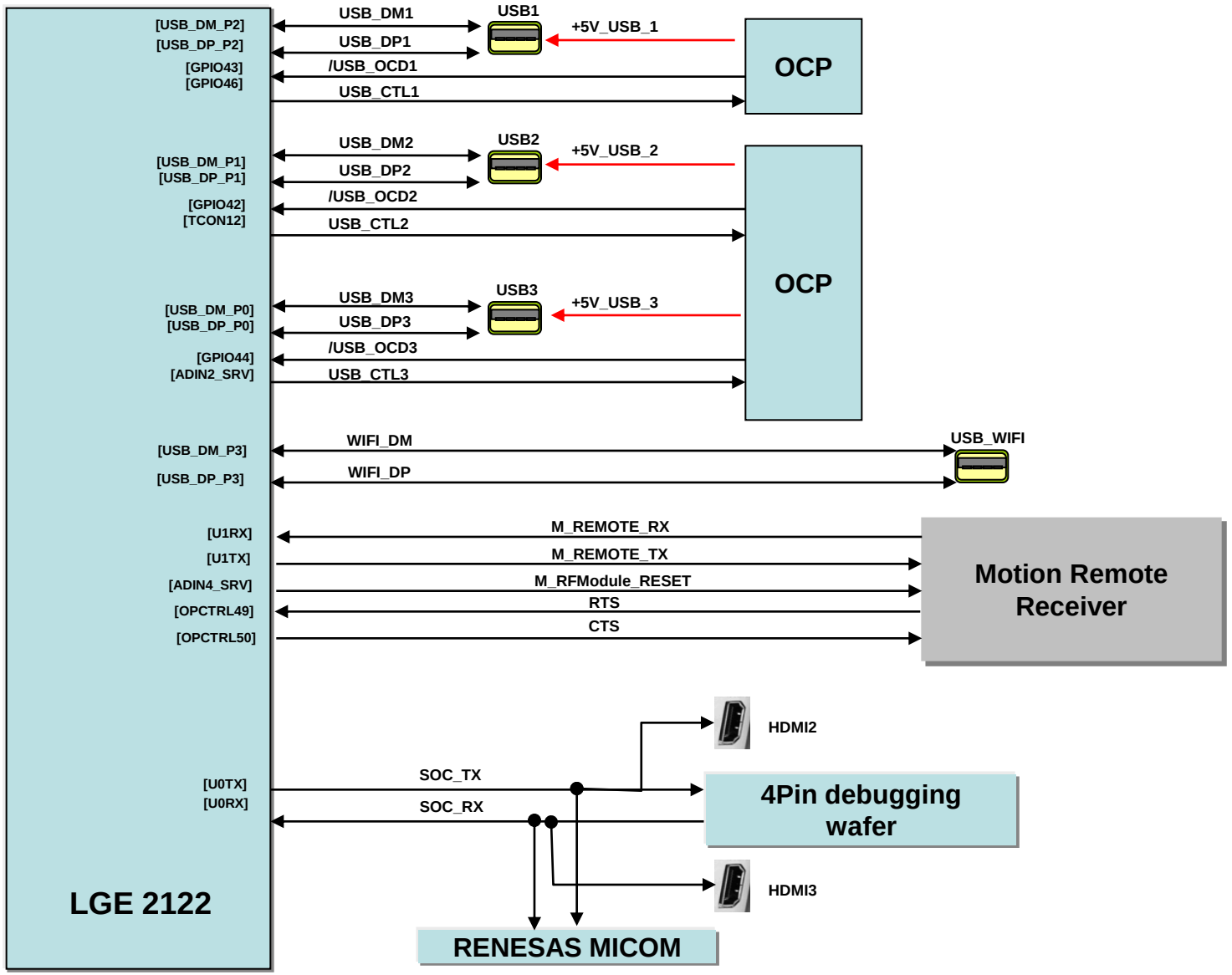
# 10. USB / WIFI / M-REMOTE / UART

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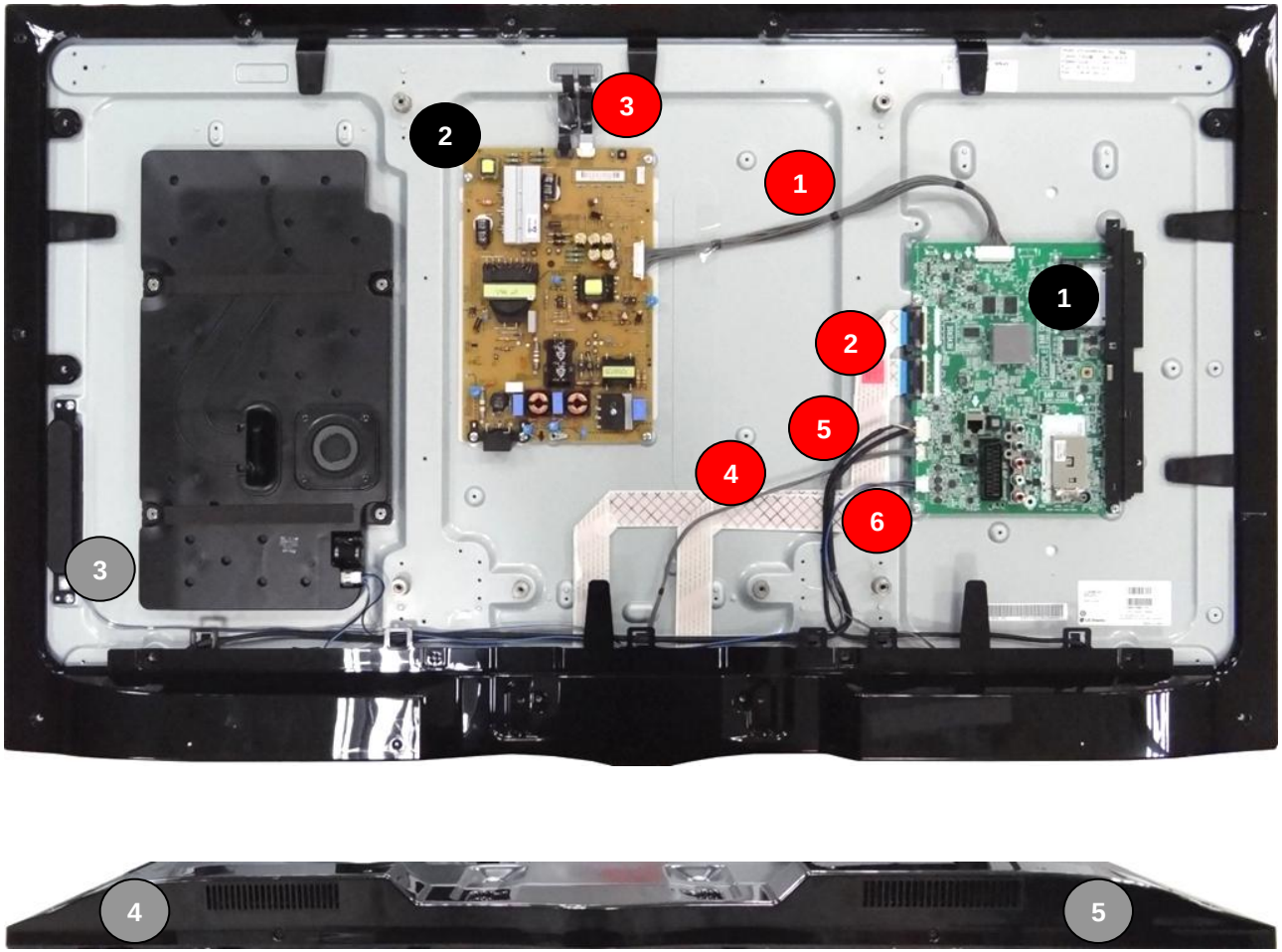
# Interconnection - 1

## 47LA660S-ZA




### [PCBs]

1. Main PCB
2. Power Board
3. Local key Assy
4. RF Assy
5. WIFI Assy

### [Cables]

1. Main / LPB 24Pin + Local Dimming Cable
2. Main / Module EPI Cable 50& 50Pin
3. LED driver / PSU
4. IR 8Pin Cable
5. WiFi 6Pin + RF 8Pin Cable
6. SPK Cable

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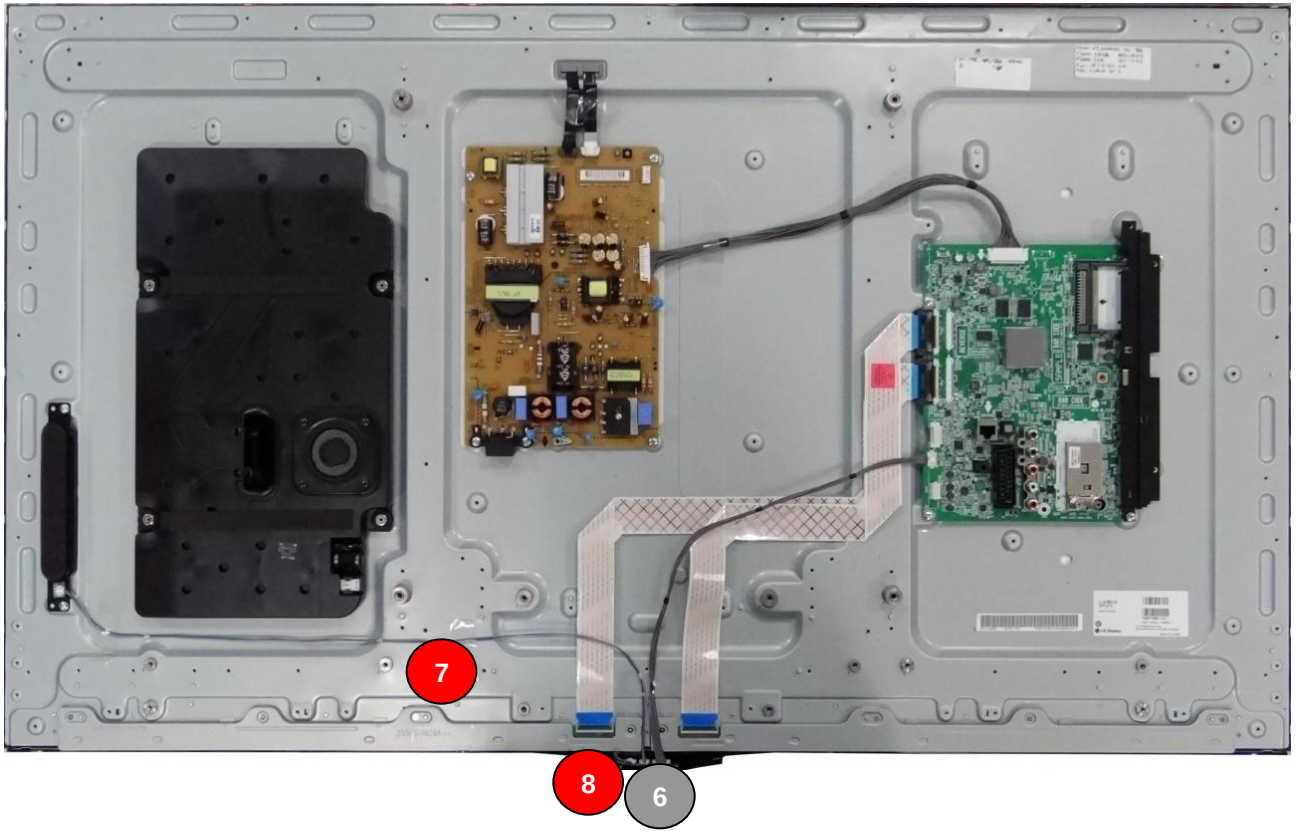
# Interconnection - 2

## 47LA660S-ZA




[PCBs]

6 **IR Assy**

[Cables]

7 **IR to Local Key 3Pin Cable**

8 **IR to Logo Assy 4Pin Cable**

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# Introductions of 13Y RF ass'y + Magic Remote control

1. System
2. Remote Buttons
3. MR13 Block Diagram
4. Function List
5. Pairing/Un-pairing Method

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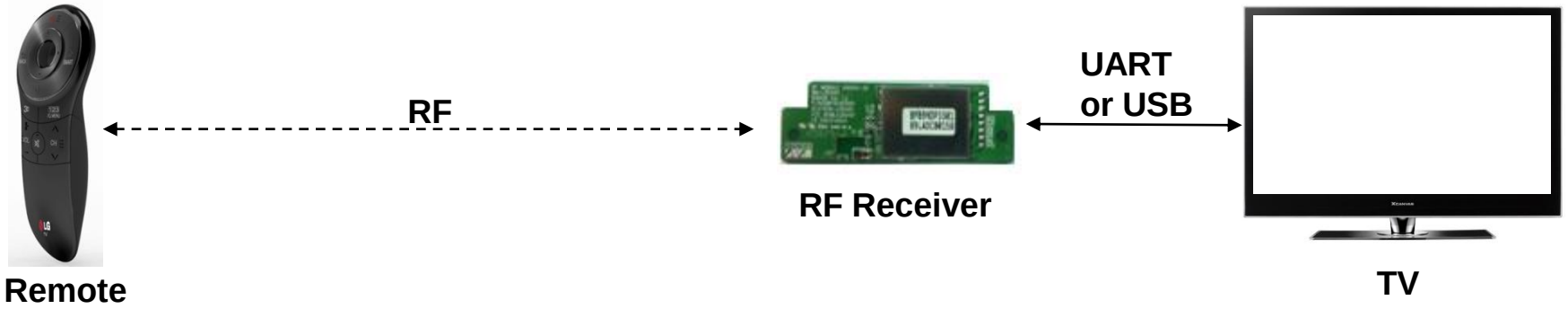
# 1. System




❖ ***Pairing Information Transmission (Send to TV after Paired)***
- Static Calibration Data (Bypass only)
- Remote FW ver. (Save also in Receiver)
- BD_ADDR (Save also in Receiver)

• ***Pairing Information Transmission Sequence***
- When it is paired, the remote sends packets(pairing success, F/W version, BD_ADDR) to the receiver.
- The receiver sends the pairing success packet to TV directly.
- F/W version and BD_ADDR packets are just saved on the receiver.
- The receiver sends F/W version or BD_ADDR packet to TV when it is required.

❖ ***Motion Data Transmission***
- Period : 7.5msec
- Motion Data : gyro, accelerometer

❖ ***Voice Data Transmission***
- Period : 10msec
- Voice sampling : 16khz 16bit

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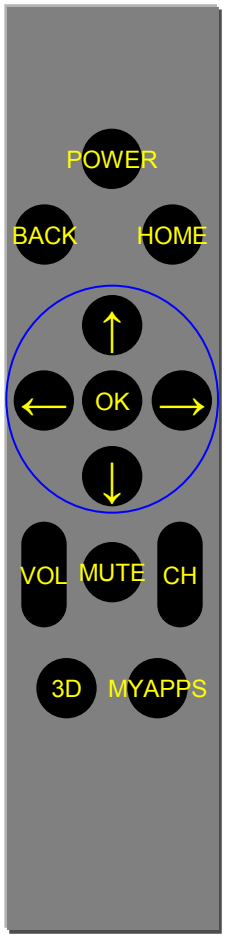
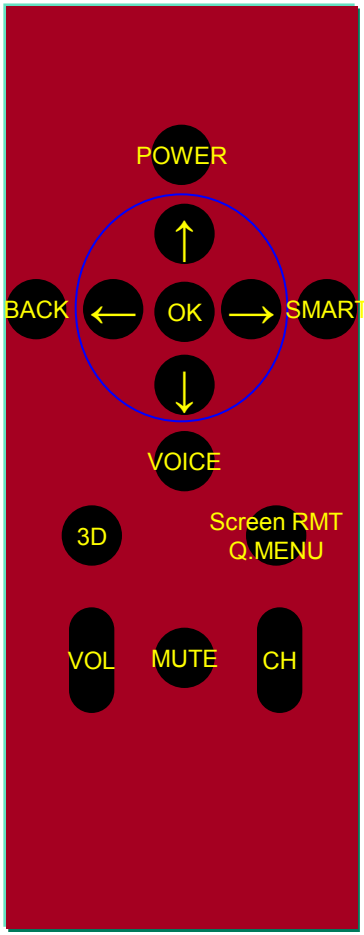
# 2. Remote Buttons (M4 vs. MR13)




M4 Remote




MR13 Remote

| BUTTON | | RF Unpaired IR_CODE | RF Paired RF_CODE | IR continuous repeat | ETC. |
|---|---|---|---|---|---|
| Phsical Buttons | POWER | 0x08 | NONE | **Y** | IR only |
| | BACK | 0x28 | 0x8028 | **Y** | |
| | SMART | 0x7C | 0x807C | **Y** | |
| | ← | 0x07 | 0x8007 | **Y** | |
| | → | 0x06 | 0x8006 | **Y** | |
| | ↑ | 0x40 | 0x8040 | **Y** | |
| | ↓ | 0x41 | 0x8041 | **Y** | |
| | OK | 0x75 | 0x8044 | **Y** | |
| | VOICE | 0xDE | 0x808B | **Y** | = VOICE_START |
| | 3D | 0xDC | 0x80DC | **Y** | |
| | Screen RMT / Q.MENU | 0xDE | 0x80DE | **Y** | |
| | CH + | 0x00 | 0x8000 | **Y** | |
| | CH - | 0x01 | 0x8001 | **Y** | |
| | VOL + | 0x02 | 0x8002 | **Y** | |
| | VOL - | 0x03 | 0x8003 | **Y** | |
| | MUTE | 0x09 | 0x8009 | **Y** | |
| Logical Buttons | AUTO_WAKEUP | X | 0x800C | | |
| | VOICE_START | X | 0x800A | | |
| | VOICE_STOP | X | 0x800D | | |
| | POINT_START | X | 0x803E | | |
| | POINT_STOP | X | 0x803F | | |

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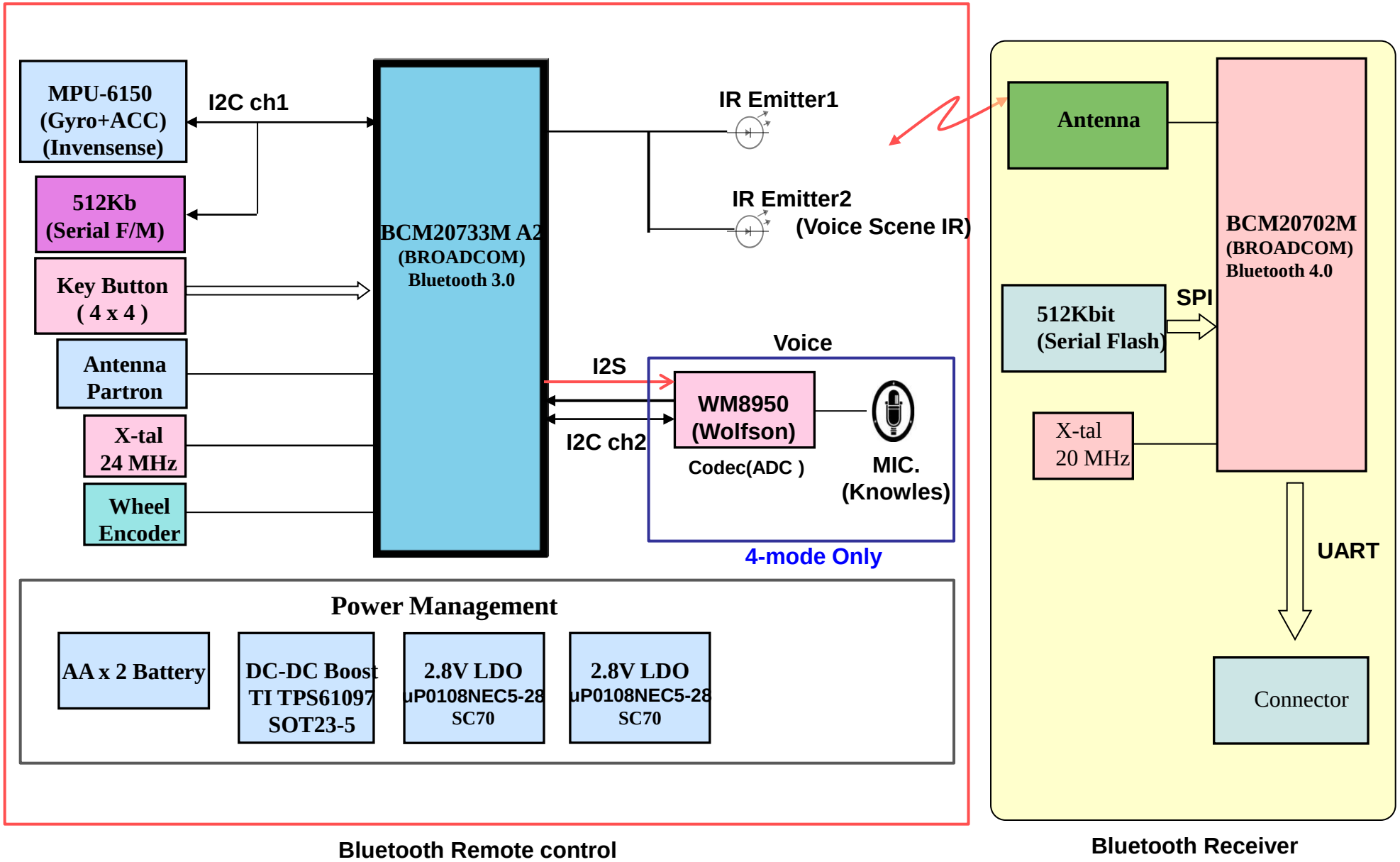
# 3. MR13 Block Diagram

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# 4. Function list

| 주요 Item | | | IC | Manufacturer | Function |
|---|---|---|---|---|---|
| Remocon | Voice | Voice Codec | WM8950 | Wolfson | 16KHz Sampling of Audio data |
| | | MEMS Mic. | SPU0414HR5H | Knowles | Sensing Voice |
| | Motion Sensor | Gyro Sensor + Accelerometer | MPU-6150 | Invensense | Sensing angular velocity of X, Y, Z-axis |
| | | | | | Sensing device tilt (Pitch & Roll angle) |
| | RF + Micom | RF Antenna | SDBTPTR3015 | Partron | Wireless communication |
| | | X-tal | 24MHz | Partron | |
| | | RF + Micom | BCM20733A2 | Broadcom | |
| | DC-DC Converter | | TPS61097 | TI | Battery Boost up Regulator |
| | LDO1 | | uP0108NEC5-28 | uPI | RF, Gyro, Accelerometer Power Supply |
| | LDO2 | | uP0108NEC5-28 | uPI | Audio Codec, Mic. Power Supply |

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# 5. RF Pairing / Un-pairing Method

| | Method | Description |
|---|---|---|
| RF Pairing | ❖ Method1<br>– If unpaired, just press "OK" button.<br>– If paired, press "OK" button after unpairing.<br>❖ Method 2 (Repairing)<br>– Press “BACK" button for 5 sec. | • When do pairing, the remote should make pairing request IR signal(0x75) to TV.<br>• When TV receive the IR signal, it should send "pairing request packet" to the RF receiver.<br>• After pairing success, the remote should blink LED for some time and TV send "pairing success packet" back to TV.<br>• When remote try to unpairing, it doesn’t care about state of receiver(stand alone). |
| RF Unpairing | Press “BACK" button and “SMART" button at the same time for 5 sec. | • When remote try to unpairing, it doesn’t care about state of receiver(stand alone).<br>• After unpairing, all pairing information should be erased.<br>• After unpairing, LED should be blinked for 3sec.<br>• The remote just becomes to IR mode. |

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# Introductions of 13Y WIFI built in ass'y

1. Wi-Fi built in Ass'y feature
2. Wi-Fi built in Ass'y specification

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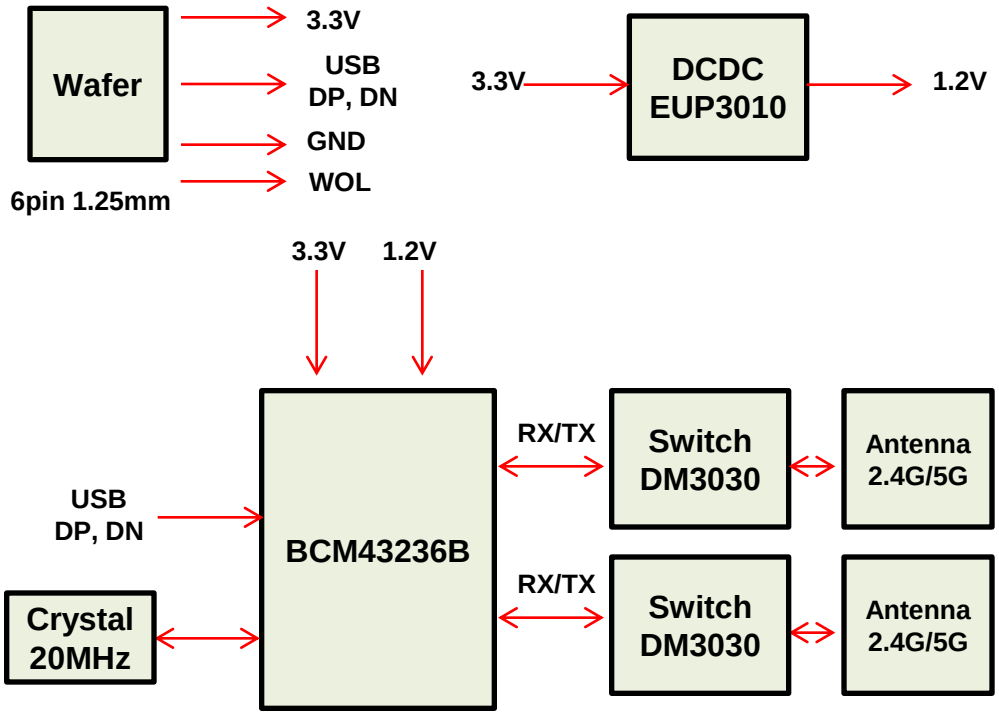
# WIFI Built in ass'y feature

## Block diagram

30

48




**- Pin map**

| PIN | USB interface |
|---|---|
| 1 | Vcc |
| 2 | DM |
| 3 | DP |
| 4 | GND |
| 5 | WOW |
| 6 | NC |

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# WIFI Built in ass'y Specification

- Frequency Band:
  - Draft 802.11n Radio: 2.4 GHz
  - 802.11g Radio: 2.4 GHz
  - 802.11b Radio: 2.4 GHz

| | |
|---|---|
| USA – FCC | 2412~2462MHz (Ch1~Ch11) |
| Canada – IC | 2412~2462MHz (Ch1~Ch11) |
| Europe – ETSI | 2412~2472MHz (Ch1~Ch13) |
| Japan – STD-T66/STD-33 | 2412~2484MHz (Ch1~Ch14) |

802.11a Radio : 5 GHz

5.150~5.250GHz

5.725~5.850GHz

- Operating Channels:

IEEE 802.11b/g/n compliant:

11 channels (US, Canada)

13 channels (ETSI)

14 channels (Japan)

- Transmit Power and Sensitivity:

TX Output Power:(Typical) (Meet emission standard)

| | | |
|---|---|---|
| 11b | 17 | +/- 2 dBm |
| 11g | 14 | +/- 2 dBm@54Mbps (Each chain) |
| 11n | 13 | +/- 2 dBm (Each chain) |

Rx Sensitivity:(Typical)

-69dBm at HT20 m7 2.4GHz

-87dBm at HT20 m0 2.4GHz

-69dBm at HT20 m7 5.0GHz

-87dBm at HT20 m0 5.0GHz

- Modulation

DBPSK @1Mbps

DQPSK@2Mbp

CCK@5.5/11Mbps

BPSK@6/9 Mbps

QPSK@12/18Mbps

16-QAM@24Mbps

64-QAM@48/54Mpb and above

- Current consumption(5V DC):

Full load: 430mA

- Operating Temperature: 0 ~ 60 ℃ ambient
- Storage Temperature: -20 ~ 60 ℃ ambient
- Humidity: under 85% and must be non-condensing

- Regulation and certification compliance available:
  - CE
  - FCC
  - WiFi

- WPS

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# Widevine & HDCP 2.0 & NETFLX

## Contents


1. Widevine?
2. HDCP 2.0 & NETFLIX?
3. DTCP?
4. Changed BOM


**2012. 12. 08**


**LCD TV**
**LCD TV** R&D Lab **/ HW1 team**



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# 1. Widevine?

**[Widevine]**

**Widevine is the Solution(Library) offering Adaptive Streaming and DRM.**
**In BBTV, when special CP do service, this module is required key.**
**Currently CP which is requested to widevine, is typically Australian Bigpond Live and North American CinemaNow.**
**Furthermore, because the future will be the spread of CP, widevine key download for the global model should be applied to production.**
**(Because operation unique key should be downloaded for Widevine , Widevine key dowmload by NSU is impossible.)**

**[Widevine Key]**
**Widevine Key is unique data stored TV for using Widevine.**

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# 2. HDCP 2.0 & NETFLIX?

## ❑ HDCP

✓ High-bandwidth Digital Content Protection

✓ Protect high-value digital motion pictures, television programs and audio against unauthorized interception and copying between a digital set top box or digital video recorder and a digital TV or PC.

✓ Specification developed by Intel Corporation to protect digital entertainment across the DVI/HDMI interface.

## ❑ Why HDCP2.0?

✓ HDCP revision 2.0 supports a broader range of wired and **wireless** interfaces.

## ❑ Netflix

✓ the services maintain a huge selection of movies and latest releases and offer DVD rentals via mail & online streaming.

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# 3. DTCP?

**[DTCP]**

**The Digital Transmission Content Protection Specification defines a cryptogrphic protocol for protecting audio/video entertainment content from unauthorized copying, intercepting, and tampering as it traverses digital transmission mechanisms such as a high-performance serial bus that conforms to the IEEE 1394-1995 standard. Only legitimate entertainment content delivered to a source device via another approved copy protection system (such as the DVD Content Scrambling System) will be protected by this protection system.**

**[Three cryptographic Keys]**

**• Authentication Key which is formed as a result of authentication and used to protect the exchange keys.**

**•Exchage Key which is used to set up and protect content streams.**

**•Content Key which is used to encrpt the content being exchanged.**

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# 4. Changed BOM

## As-Was

| Model Info | | | |
|---|---|---|---|
| Platform | GP4 | Ex) GP1R / GP2 / GP4 / Startrek | |
| Main IC | MT5369 | Ex) BCM3549 / L9 / MTK / LM1 | |
| **Model Data** | | | |
| *Tool Option1* | 32967 | Country Group | EU |
| Tool Option2 | 41027 | Country | |
| Tool Option3 | 17245 | Area Code or Option | 162 |
| Tool Option4 | 37481 | | |
| Tool Option5 | 23191 | | |
| Tool Option6 | 1323 | | |
| Tool Option7 | 13615 | | |
| Commercial Tool Option | | | |
| **Function** | | | |
| *Model/SN Write* | Yes | *Widevine* | Yes |
| *CI + Download* | Yes | *Built-In Wifi* | Yes |
| *MAC Address* | Yes | *DVB-S* | Yes |
| *ESN Download* | Yes | *Wasu* | NO |
| *Marlin* | NO | *CNTV* | NO |
| *HDCP Tx* | NO | *DTCP Rx* | NO |
| *HDCP Rx* | Yes | | |

주3) CNTV [Yes]: China Smart TV Only(CNTV ID 필요 모델)

## Current

| Model Info | | | |
|---|---|---|---|
| Platform | NETCAST4 | Ex) GP1R / GP2 / GP4 / Startrek | |
| Main IC | MTK5398 | Ex) BCM3549 / L9 / MTK / LM1 | |
| **Model Data** | | | |
| *Tool Option1* | 133 | Country Group | EU |
| Tool Option2 | 12817 | Country | |
| Tool Option3 | 29368 | Area Code or Option | 1154 |
| Tool Option4 | 61754 | | |
| Tool Option5 | 14742 | | |
| Tool Option6 | 1354 | | |
| Tool Option7 | 47247 | | |
| Commercial Tool Option | | | |
| **Function** | | | |
| *Model/SN Write* | Yes | *Widevine* | Yes |
| *CI + Download* | Yes | *Built-In Wifi* | Yes |
| *MAC Address* | Yes | *DVB-S* | Yes |
| *ESN Download* | Yes | *Wasu* | NO |
| *Marlin* | NO | *CNTV* | NO |
| *HDCP 2.0 Tx* | NO | *DTCP Rx* | NO |
| *HDCP 2.0 Rx* | Yes | *Google CA* | NO |
| *HDCP 1.4 Rx* | Yes | | |

주3) CNTV [Yes]: China Smart TV Only(CNTV ID 필요 모델)

❍**Changed Item**

: Separate HDCP check box.

- HDCP 2.0 Tx
- HDCP 2.0 Rx
- HDCP 1.4 Rx

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# Contents of LCD TV Standard Repair Process


| No. | Error symptom (High category) | Error symptom (Mid category) | Page | Remarks |
|---|---|---|---|---|
| 1 | A. Video error | No video/Normal audio | 1 | |
| 2 | | No video/No audio | 2 | |
| 3 | | Video error, video lag/stop, fail tunning | 3, 4 | |
| 4 | | Color error | 5 | |
| 5 | | Vertical/Horizontal bar, residual image, light spot, external device color error | 6 | |
| 6 | B. Power error | No power | 7 | |
| 7 | | Off when on, off while viewing, power auto on/off | 8 | |
| 8 | C. Audio error | No audio/Normal video | 9 | |
| 9 | | Wrecked audio/discontinuation/noise | 10 | |
| 10 | D. Function error | No response in remote controller, key error, recording error, memory error | 11 | |
| 11 | | External device recognition error | 12 | |
| 12 | E. Noise | Circuit noise, mechanical noise | 13 | |
| 13 | F. Exterior error | Exterior defect | 14 | |
| 14 | G. Network error | Connection defect / Network speed low | 15 | |


First of all, Check whether there is SVC Bulletin in GCSC System for these model.

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# Contents of LCD TV Standard Repair Process Detail Technical Manual


| No. | Error symptom | Content | Page | Remarks |
|---|---|---|---|---|
| 1 | A. Video error_ No video/Normal audio | Check LCD back light with naked eye | A1 | |
| 2 | | LED driver  B+ 24V measuring method | A2 | |
| 3 | | Check White Balance value | A3 | |
| 4 | | Power Board voltage measuring method | A4 | |
| 6 | A. Video error_ No video/Video lag/stop | TUNER input signal strength checking method | A6 | |
| 7 | | LCD-TV Version checking method | A7 | |
| 9 | A. Video error_Color error | LCD TV connection diagram | A8 | |
| 10 | | Tuner Checking Part | A9 | |
| 11 | | Check Link Cable (LVDS) reconnection condition | A10<br>A11 | A10 : 32/37/42/47/55<br>A11 : 32 AUO |
| 12 | | Adjustment Test pattern - ADJ Key | A12 | |
| 13 | A. Video error_Vertical/Horizontal bar, residual image, light spot | LCD TV connection diagram | A8 | |
| 14 | | Check Link Cable (LVDS) reconnection condition | A10<br>A11 | A10 : 32/37/42/47/55<br>A11 : 32 AUO |
| 15 | | Adjustment Test pattern - ADJ Key | A12 | |
| 16 | <Appendix><br>Defected Type caused by T-Con/ Inverter/ Module | Exchange T-Con Board (1) | A-1/5 | |
| 17 | | Exchange T-Con Board (2) | A-2/5 | |
| 18 | | Exchange LED driver Board (PSU) | A-3/5 | 55" : driver board<br>Other : PSU |
| 19 | | Exchange Module itself (1) | A-4/5 | |
| 20 | | Exchange Module itself (2) | A-5/5 | |


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Continue to the next page

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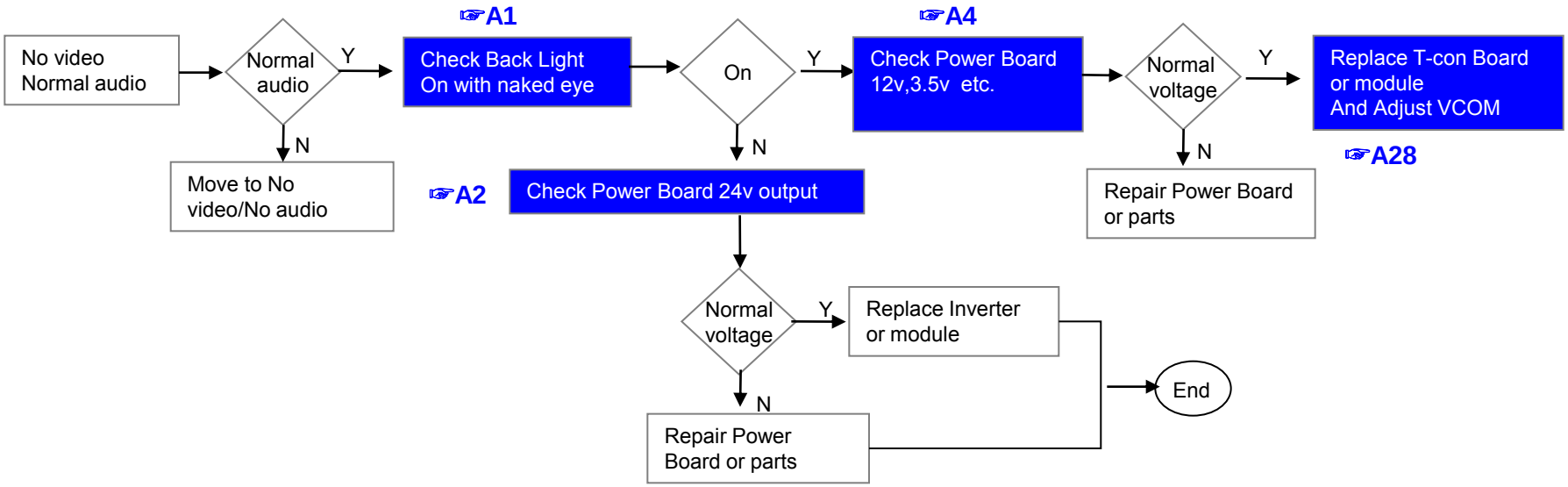
Standard Repair Process

| LCD TV | Error symptom | A. Video error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | No video/ Normal audio | Revised date | | |

**First of all, Check whether all of cables between board is inserted properly or not.**
**(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,)**




※Precaution ☞A7 & A3

Always check & record S/W Version and White Balance value before replacing the Main Board → Replace Main Board → Re-enter White Balance value

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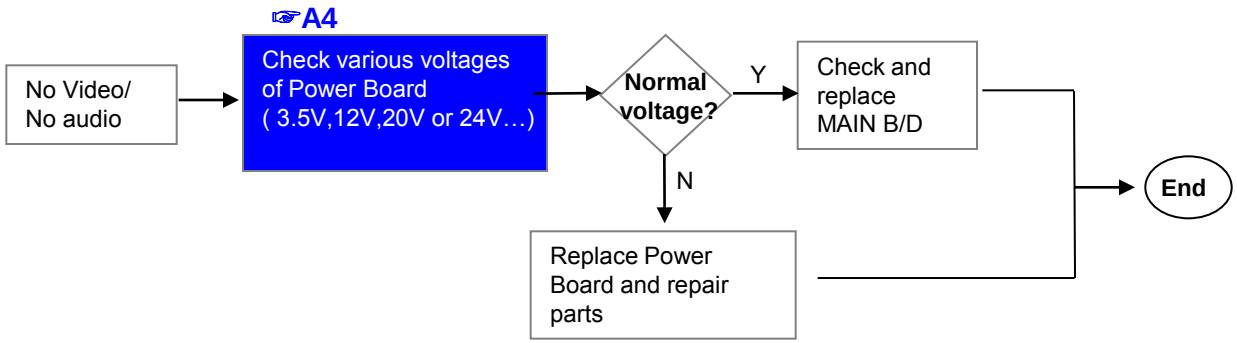
Standard Repair Process

| LCD TV | Error symptom | A. Video error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | No video/ No audio | Revised date | | |

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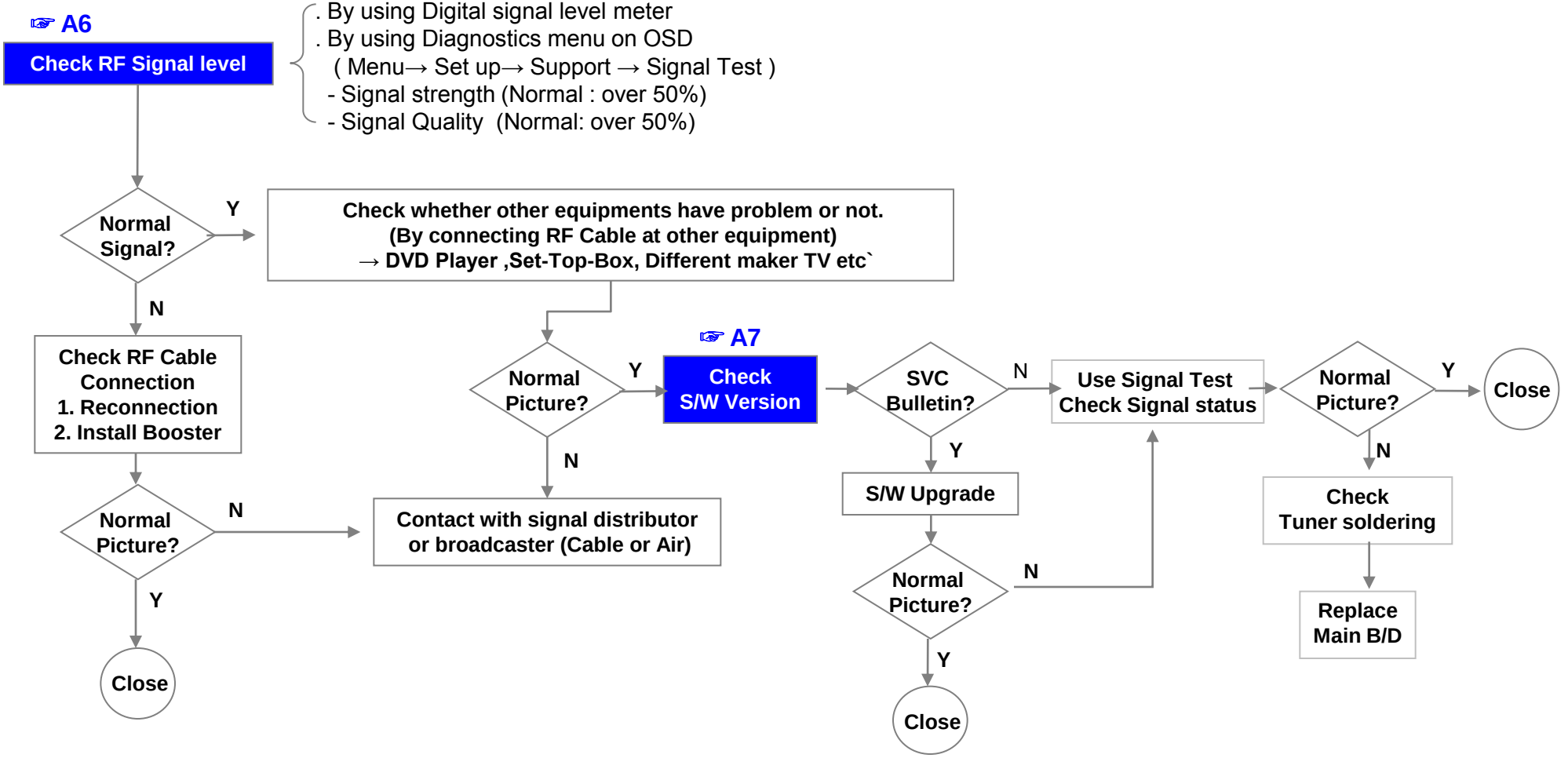
Standard Repair Process

| LCD TV | Error symptom | A. Picture Problem | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Picture broken/ Freezing | Revised date | | |

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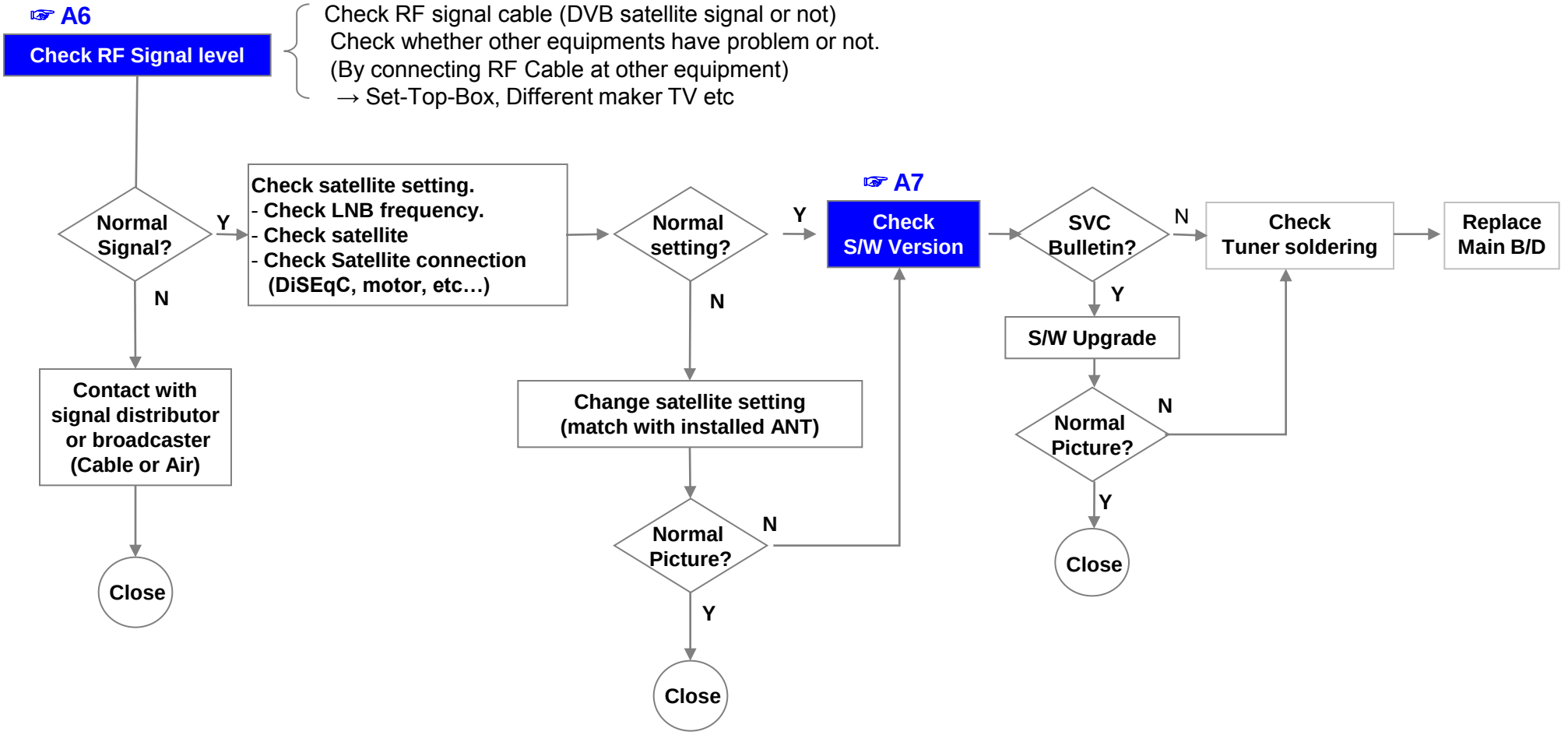
Standard Repair Process

| LCD TV | Error symptom | A. Picture Problem (DVB-S/S2) | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Tuning fail, Picture broken/ Freezing | Revised date | | |

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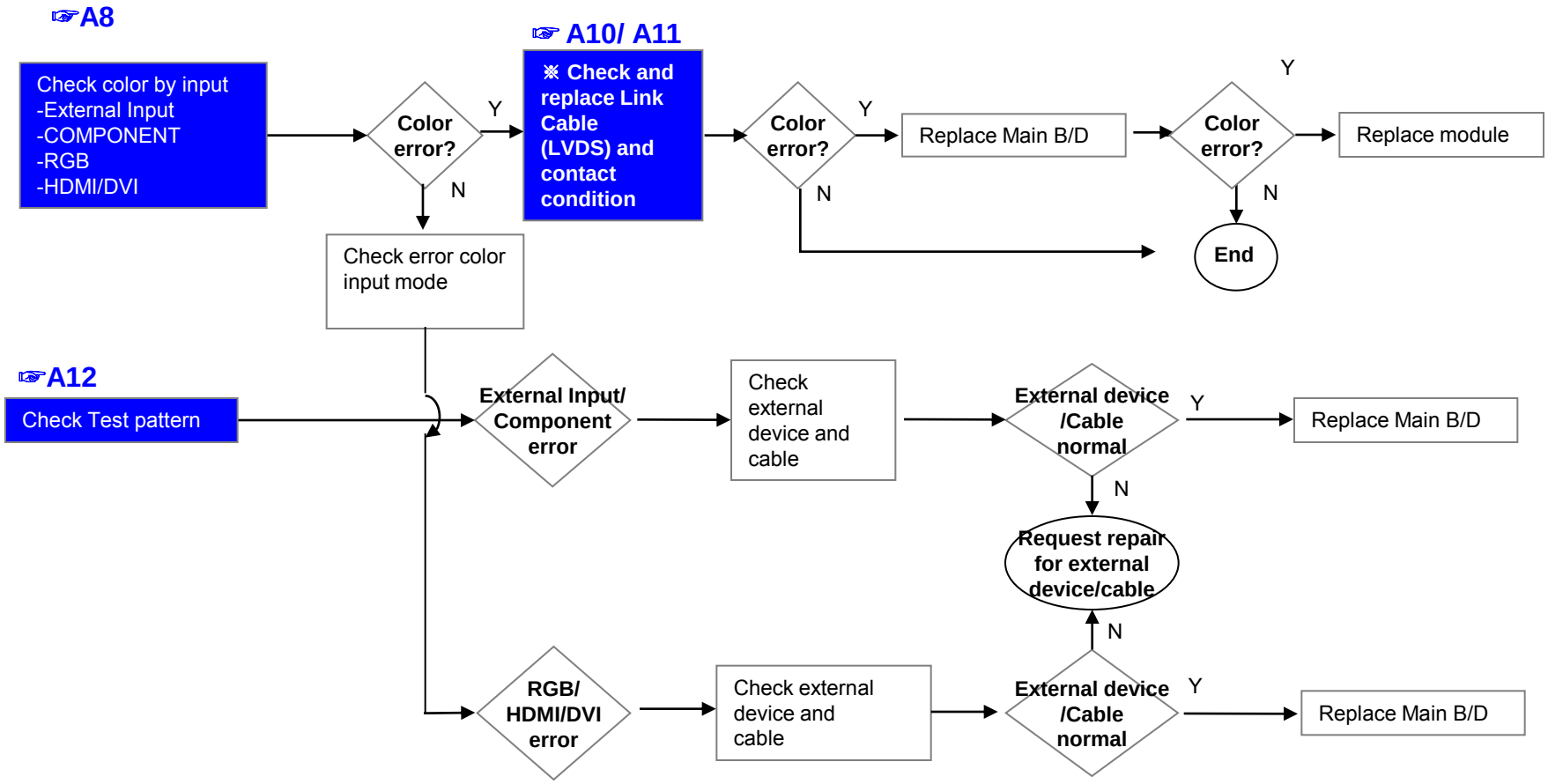
Standard Repair Process

| LCD TV | Error symptom | A. Video error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Color error | Revised date | | |

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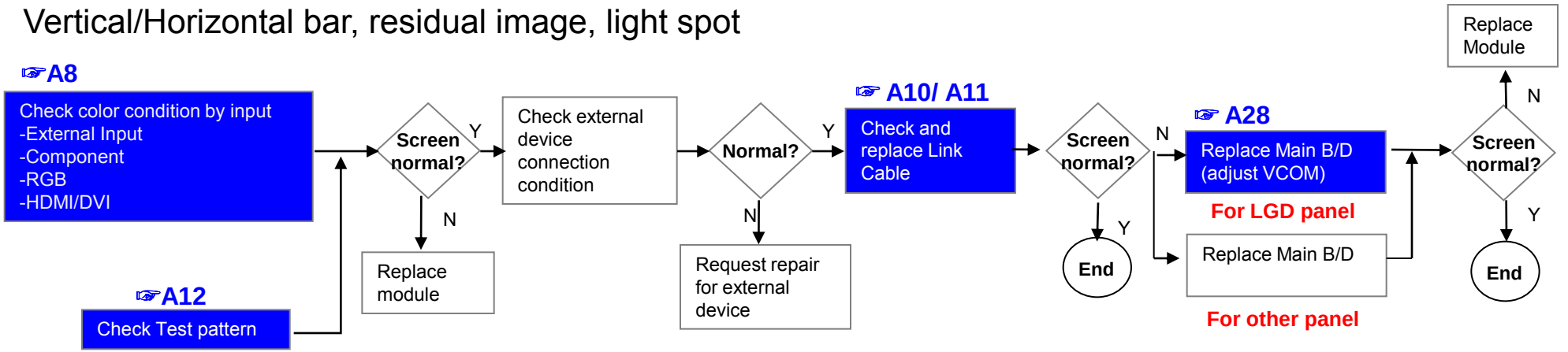
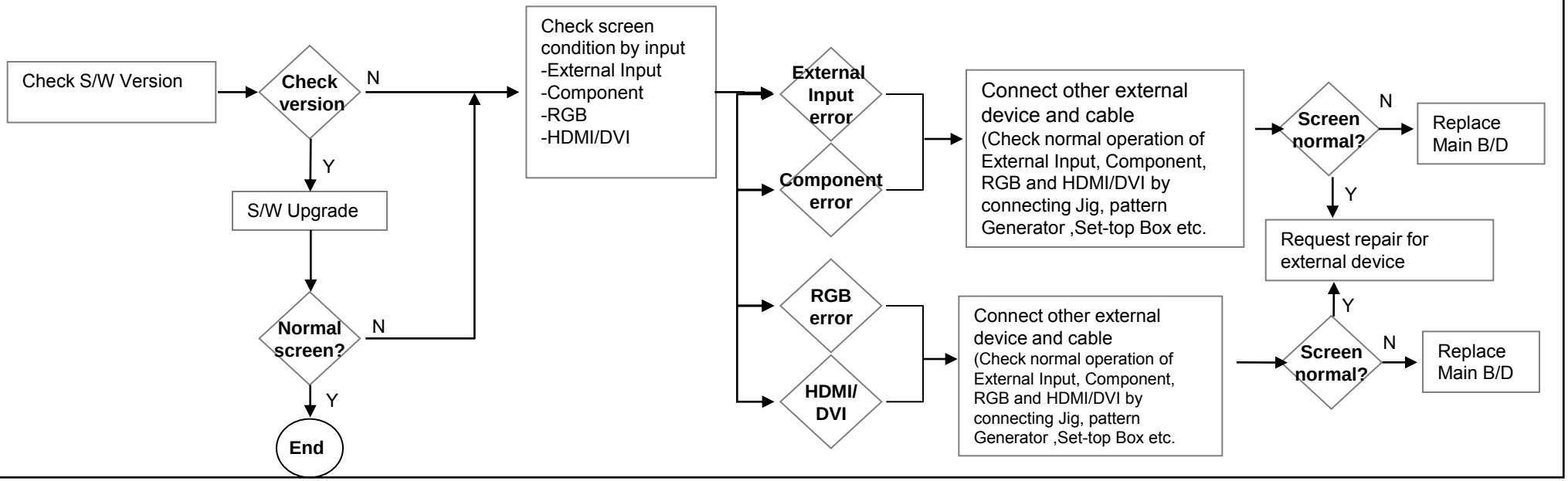
| LCD TV | Error symptom | A. Video error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Vertical / Horizontal bar, residual image, light spot, external device color error | Revised date | | |

## Vertical/Horizontal bar, residual image, light spot




## External device screen error-Color error

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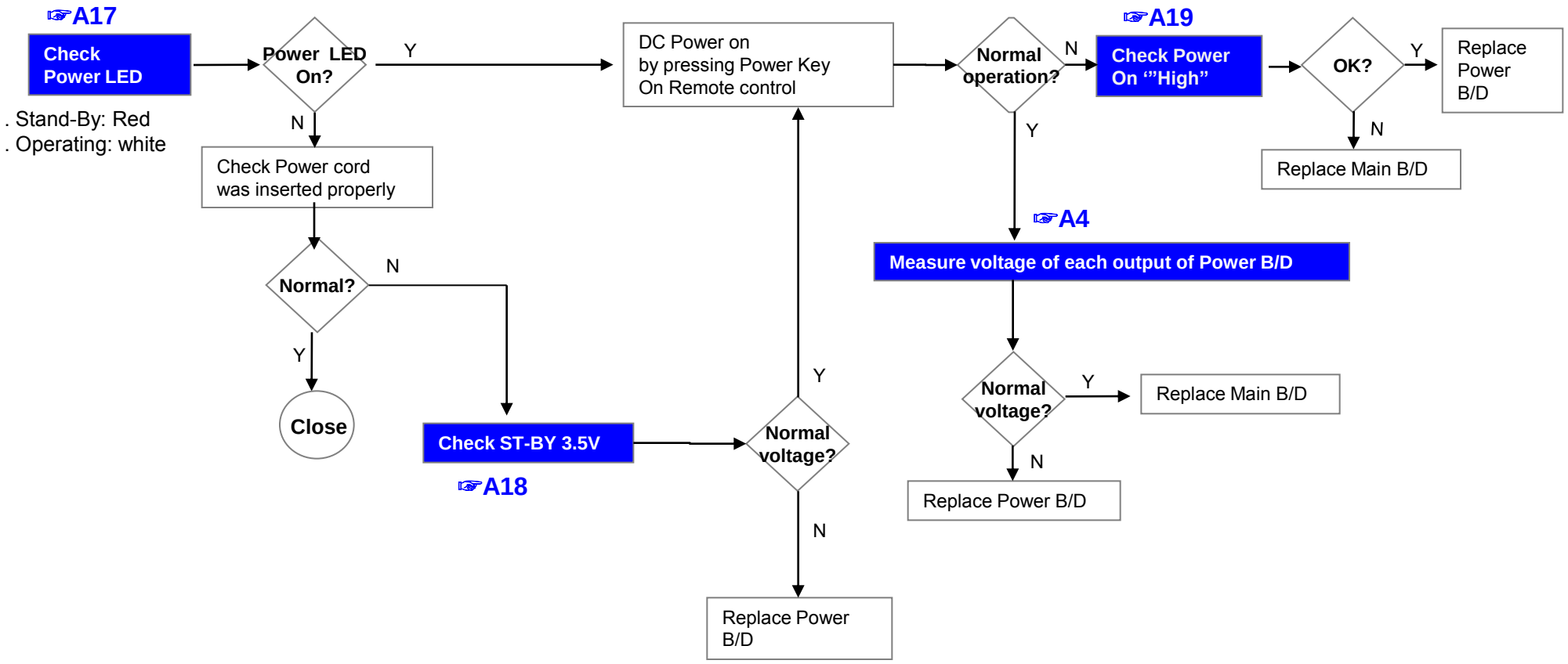
Standard Repair Process

| LCD TV | Error symptom | B. Power error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | No power | Revised date | | |

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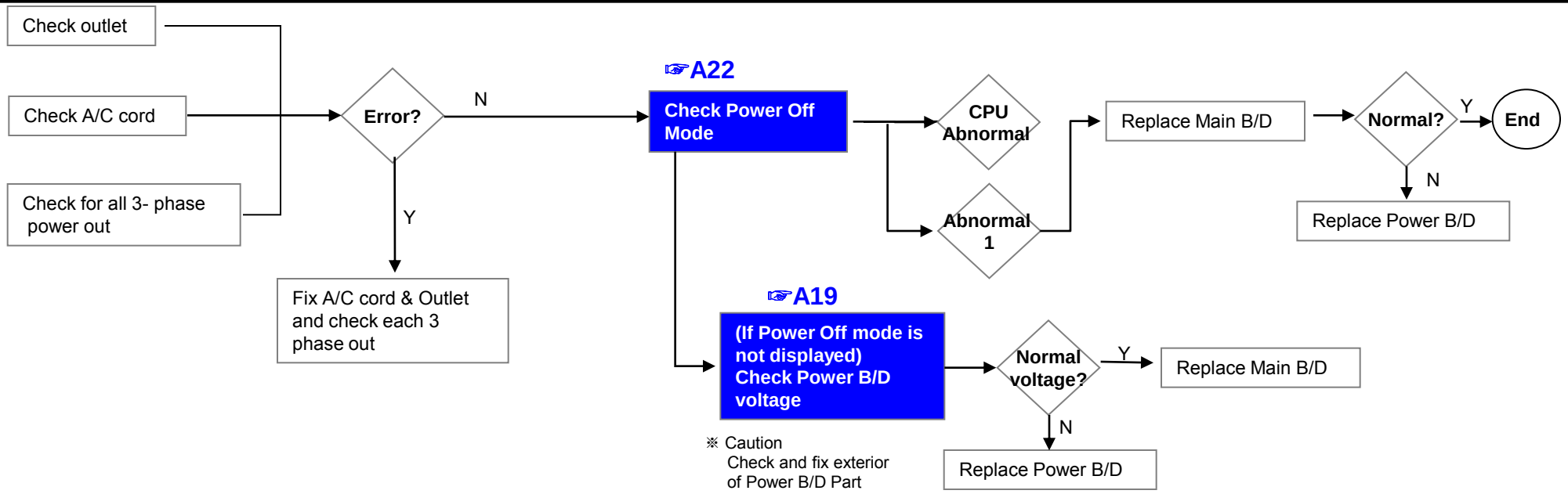
| LCD TV | Error symptom | B. Power error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Off when on, off while viewing, power auto on/off | Revised date | | |




*** Please refer to the all cases which can be displayed on power off mode.**

| Status | Power off List | Explanation |
|---|---|---|
| Normal | "POWEROFF_REMOTEKEY" | Power off by REMOTE CONTROL |
| | "POWEROFF_OFFTIMER" | Power off by OFF TIMER |
| | "POWEROFF_SLEEPTIMER" | Power off by SLEEP TIMER |
| | "POWEROFF_INSTOP" | Power off by INSTOP KEY |
| | "POWEROFF_AUTOOFF" | Power off by AUTO OFF |
| | "POWEROFF_ONTIMER" | Power off by ON TIMER |
| | "POWEROFF_RS232C" | Power off by RS232C |
| | "POWEROFF_RESREC" | Power off by Reservated Record |
| | "POWEROFF_RECEND" | Power off by End of Recording |
| | "POWEROFF_SWDOWN" | Power off by S/W Download |
| | "POWEROFF_UNKNOWN" | Power off by unknown status except listed case |
| Abnormal | "POWEROFF_ABNORMAL1" | Power off by abnormal status except CPU trouble |
| | "POWEROFF_CPUABNORMAL" | Power off by CPU Abnormal |

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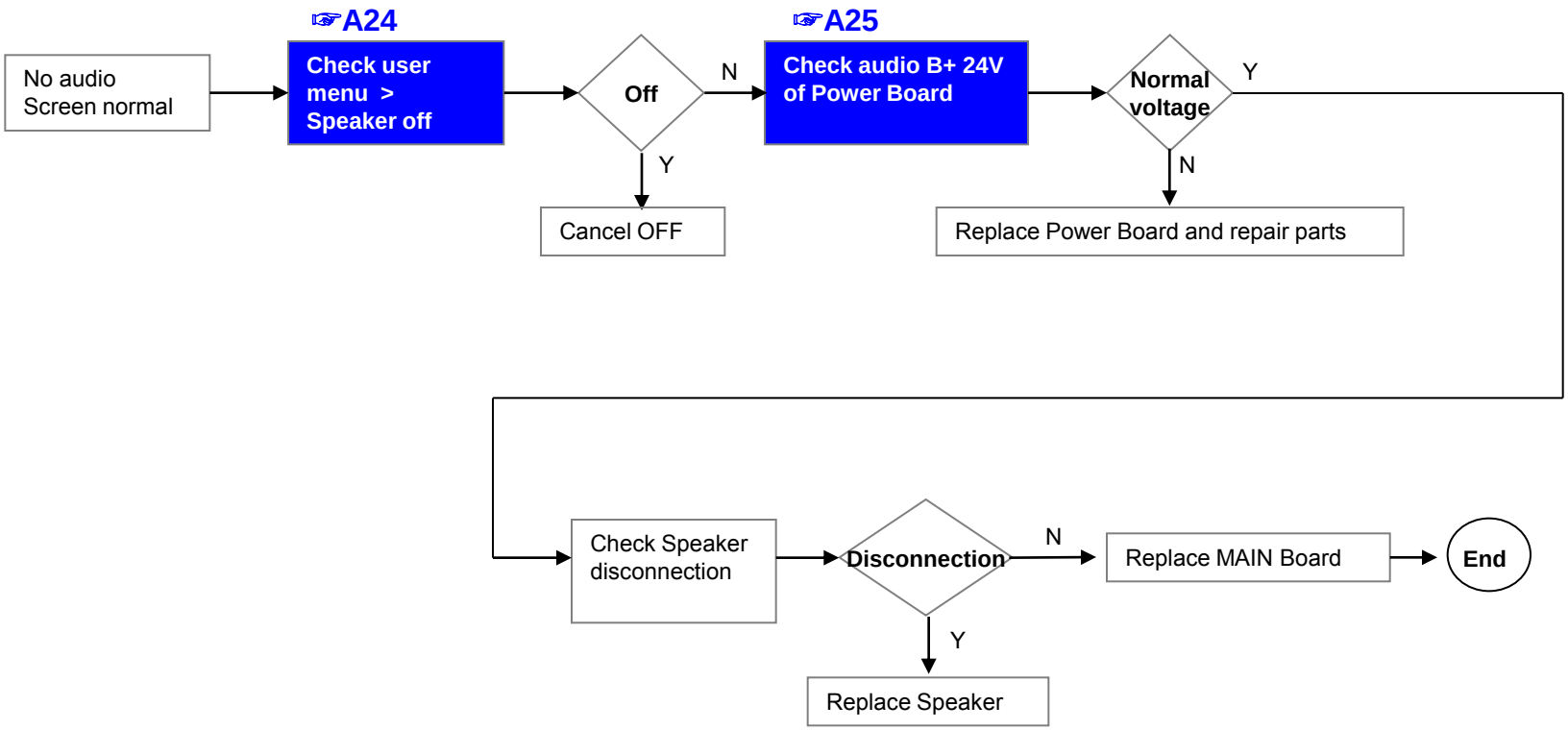
Standard Repair Process

| LCD TV | Error symptom | C. Audio error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | No audio/ Normal video | Revised date | | |

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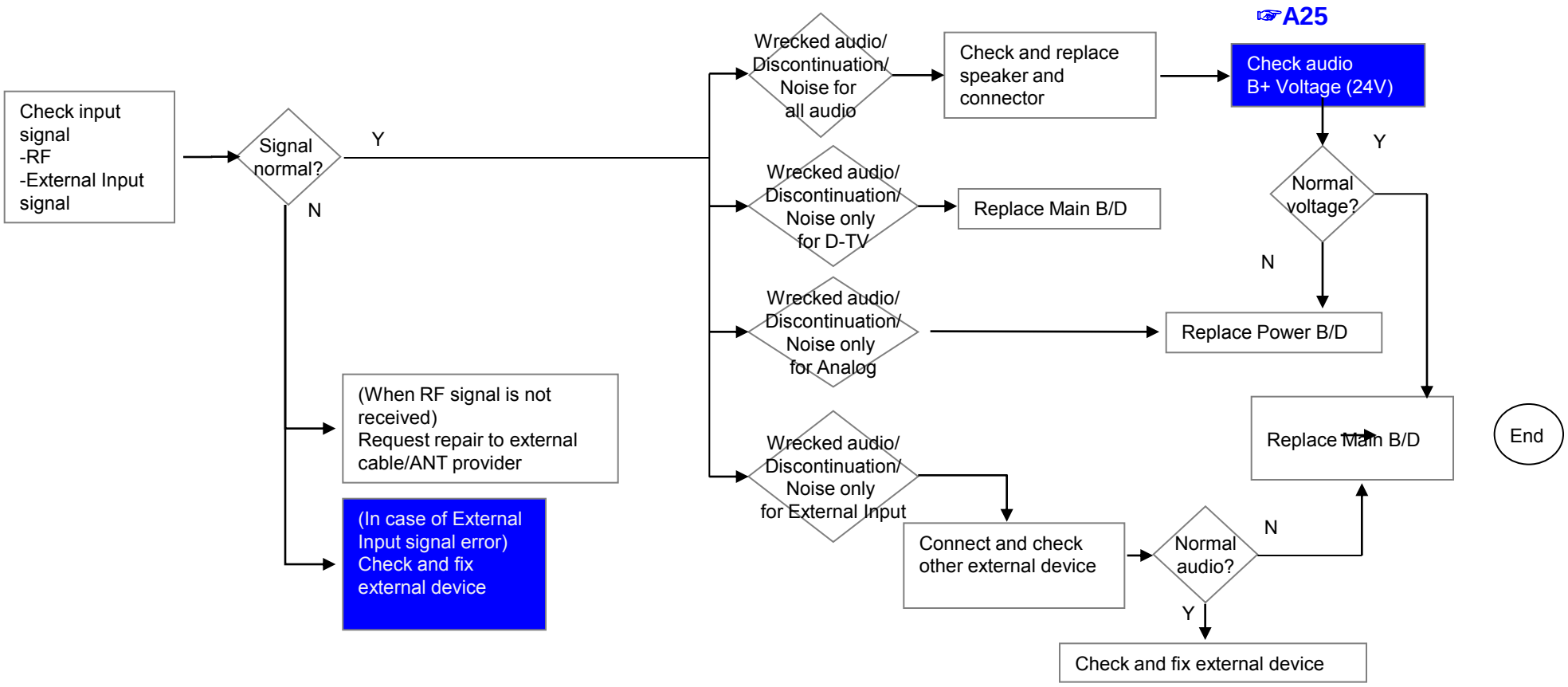
| LCD TV | Error symptom | C. Audio error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Wrecked audio/ discontinuation/noise | Revised date | | |

**→ abnormal audio/discontinuation/noise is same after “Check input signal” compared to No audio**

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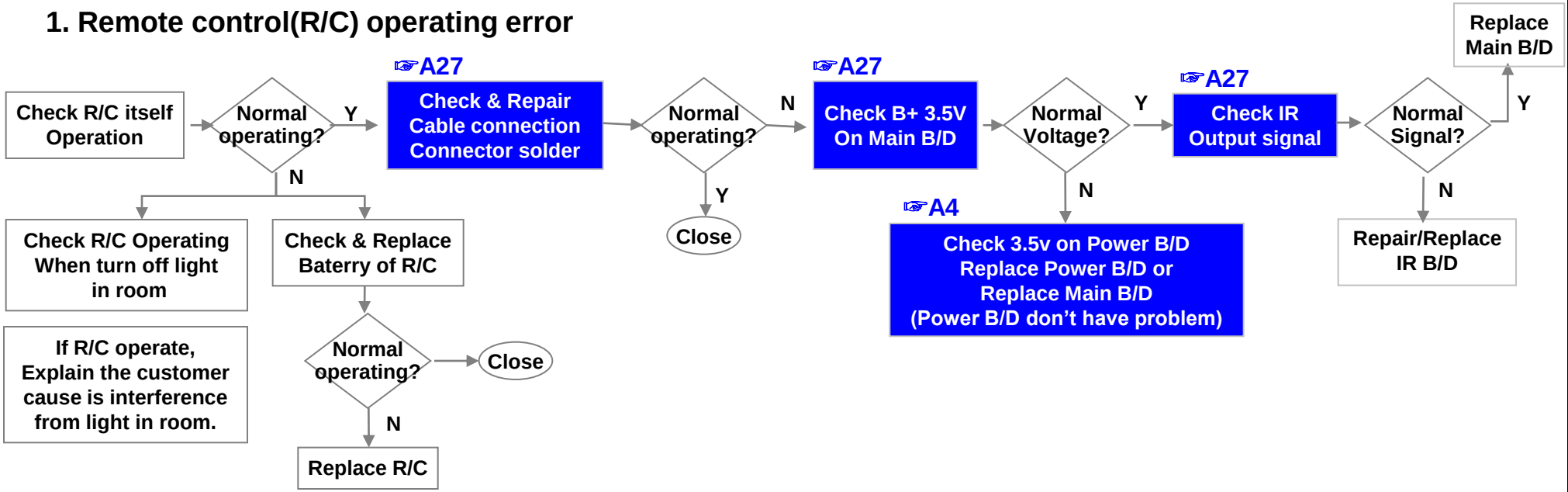
| LCD TV | Error symptom | D. General Function Problem | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Remote control & Local switch checking | Revised date | | |

## 1. Remote control(R/C) operating error

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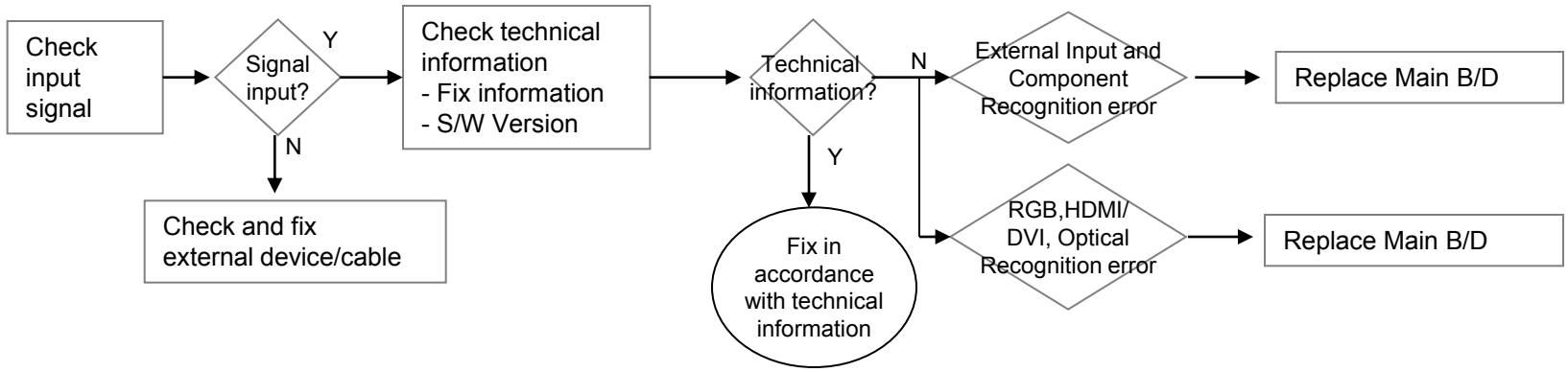
| LCD TV | Error symptom | D. Function error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | External device recognition error | Revised date | | |

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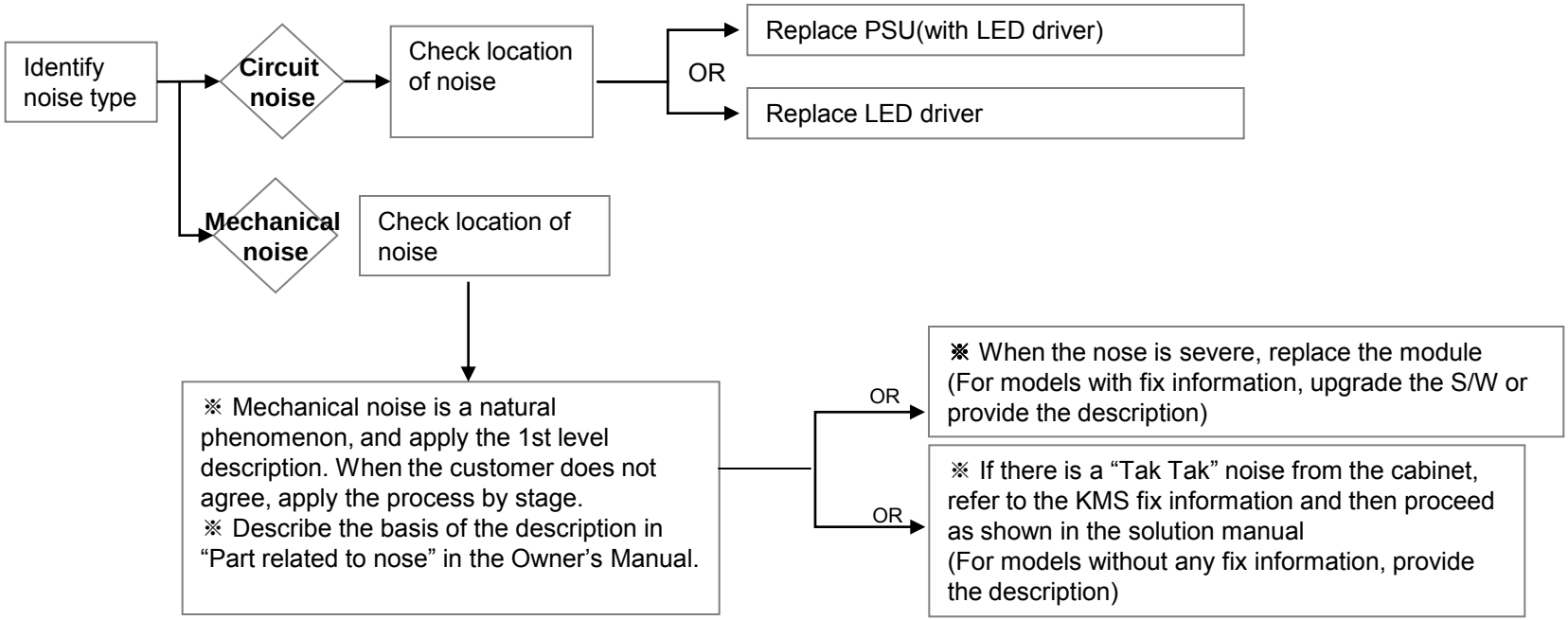
**Standard Repair Process**

| LCD TV | Error symptom | E. Noise | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Circuit noise, mechanical noise | Revised date | | |


Identify noise type
Circuit noise
Check location of noise
OR
Replace PSU(with LED driver)
Replace LED driver
Mechanical noise
Check location of noise
※ Mechanical noise is a natural phenomenon, and apply the 1st level description. When the customer does not agree, apply the process by stage.
※ Describe the basis of the description in "Part related to nose" in the Owner's Manual.
OR
※ When the nose is severe, replace the module (For models with fix information, upgrade the S/W or provide the description)
OR
※ If there is a "Tak Tak" noise from the cabinet, refer to the KMS fix information and then proceed as shown in the solution manual (For models without any fix information, provide the description)

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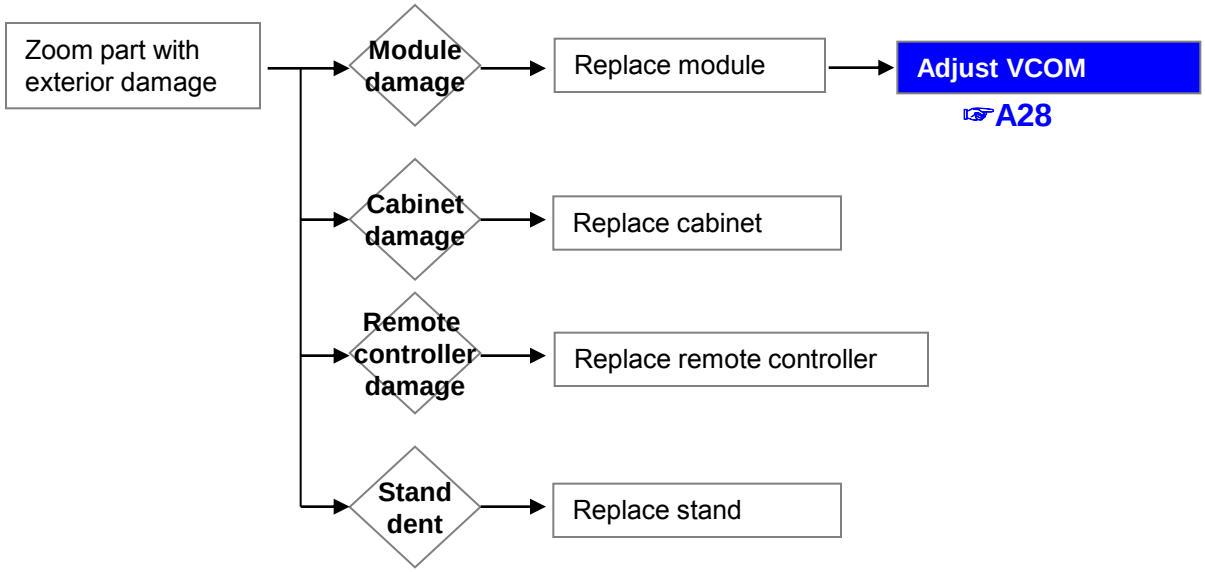
Standard Repair Process

| LCD TV | Error symptom | F. Exterior defect | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Exterior defect | Revised date | | |

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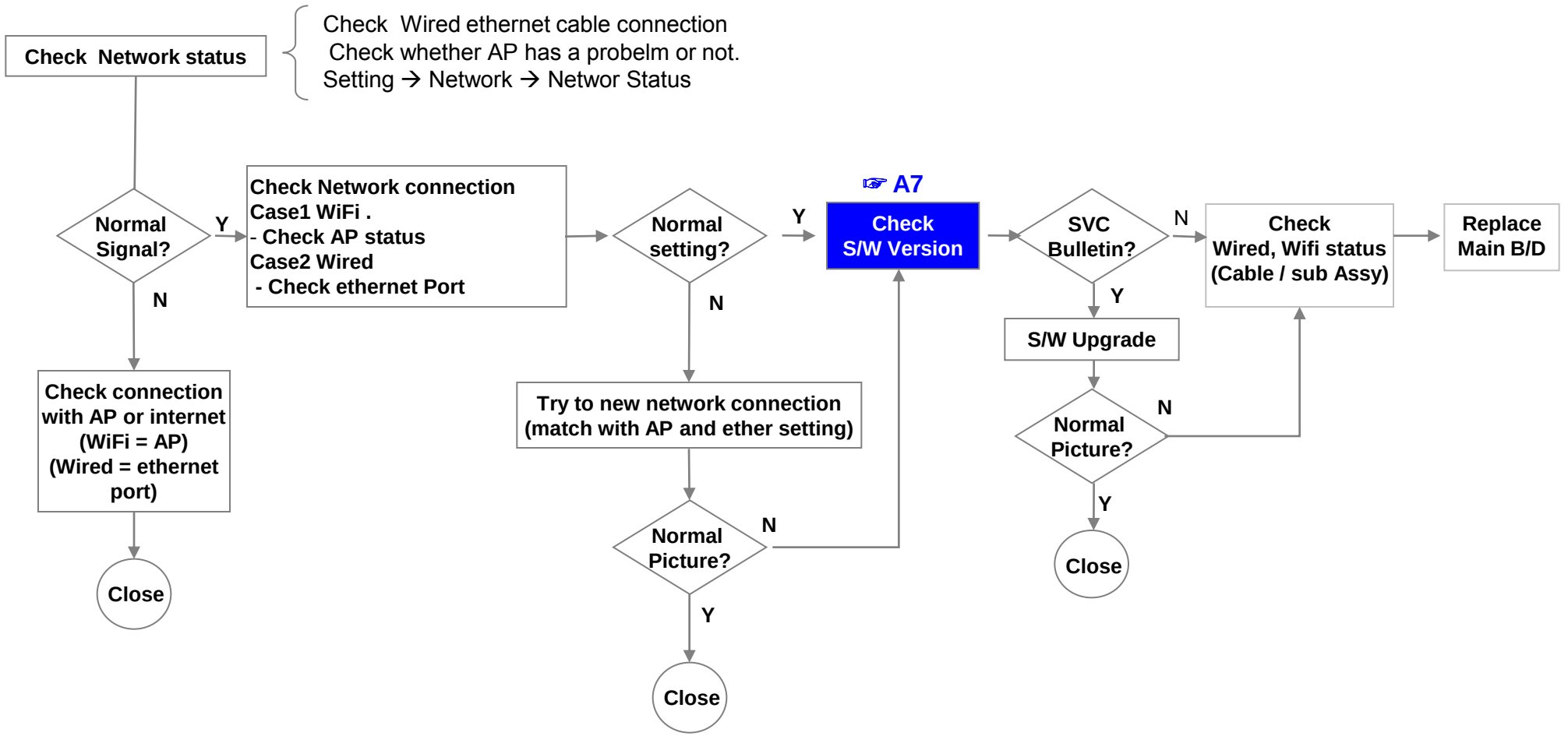
| LCD TV | Error symptom | G. Network Error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Exterior defect | Revised date | | |

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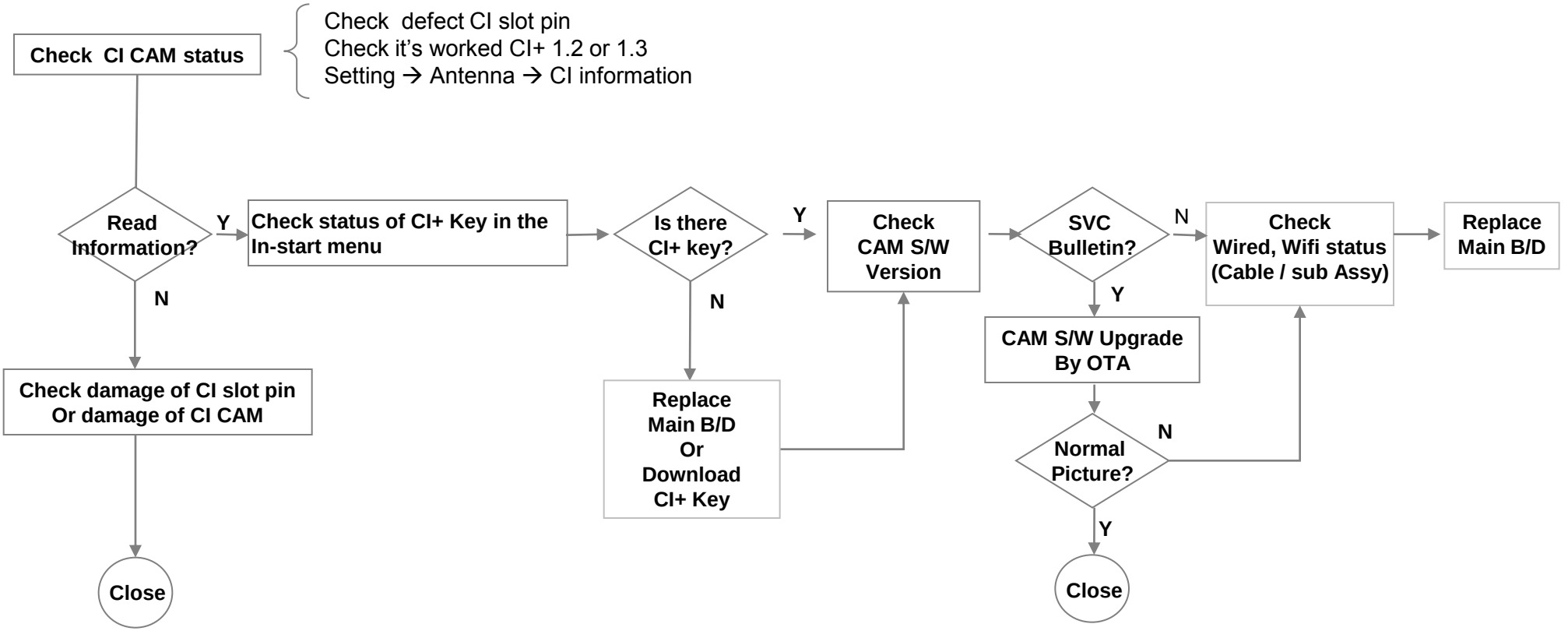
Standard Repair Process

| LCD TV | Error symptom | G. CI+ Competibility Error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | | Exterior defect | Revised date | | |




**Old version of CI+ 1.2 CAM** is not worked at the TV that is supported CI+ 1.3
➔ Check SVC Bulletin

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# Contents of LCD TV Standard Repair Process Detail Technical Manual

**Continued from previous page**


| No. | Error symptom | Content | Page | Remarks |
|---|---|---|---|---|
| 21 | B. Power error_No power | Check front display LED | A17 | |
| 22 | | Check power input Voltage & ST-BY 3.5V | A18 | |
| 23 | | Checking method when power is ON | A19 | |
| 24 | | POWER BOARD voltage measuring method | A5 | |
| 25 | | | | |
| 26 | B. Power error_Off when on, off while viewing | POWER OFF MODE checking method | A22 | |
| 27 | B. Power error_Off when on, off while viewing | POWER BOARD PIN voltage checking method | A19 | |
| 28 | C. Audio error_No audio/Normal video | Checking method in menu when there is no audio | A24 | |
| 29 | | Voltage and speaker checking method when there is no audio | A25 | |
| 30 | C. Audio error_Wrecked audio/discontinuation | Voltage and speaker checking method in case of audio error | A25 | |
| 31 | D. Function error_ No response in remote controller, key error | Remote controller operation checking method | A27 | |
| 32 | D. VCOM Adjustment | Sequence of the Vcom adjustment | A28 | |


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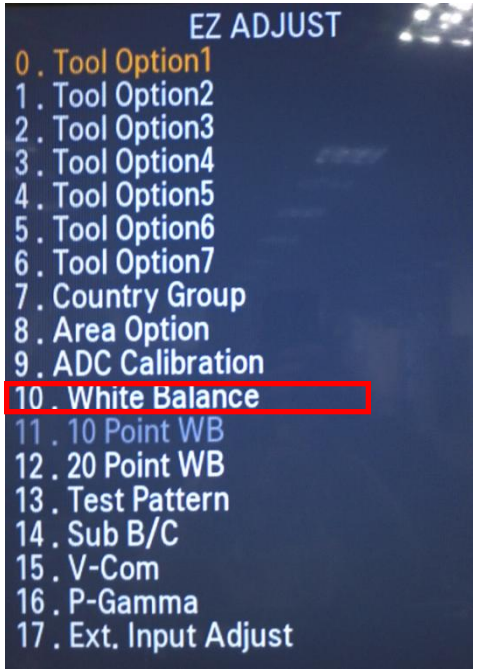
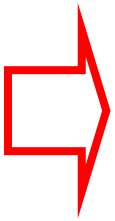
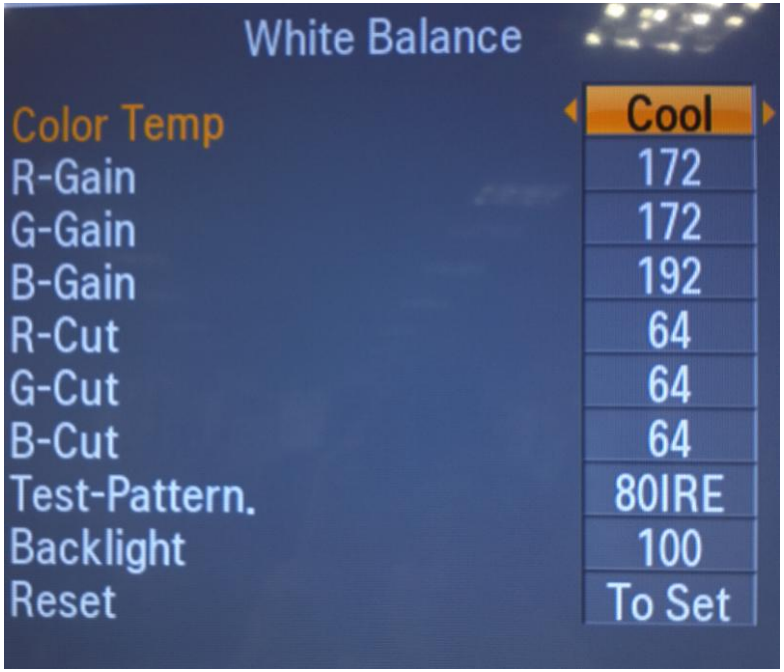
| LCD TV | Error symptom | A. Video error_No video/Normal audio | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Check White Balance value | Revised date | | A4 |

<ALL MODELS>






**Entry method**

1. Press the ADJ button on the remote controller for adjustment.

2. Enter into White Balance of item 10.

3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

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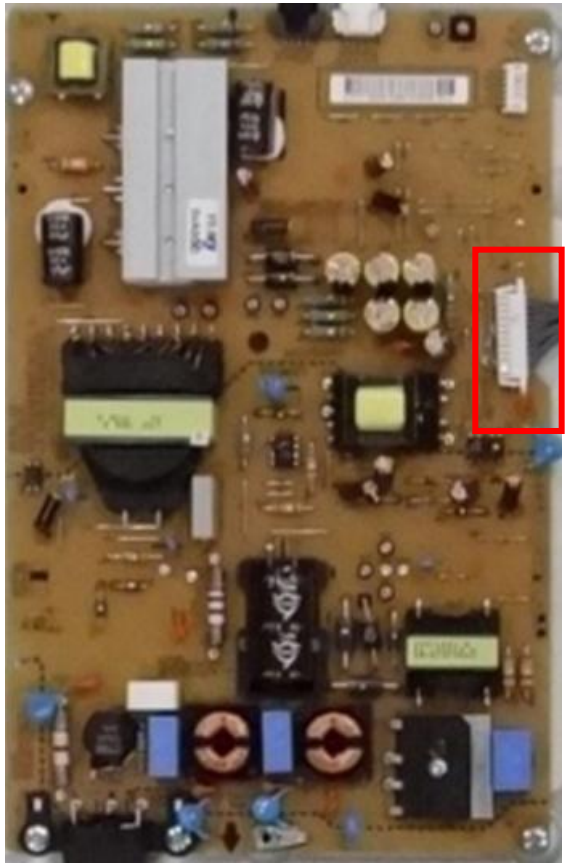
| LCD TV | Error symptom | A. Video error_No video/ Audio | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Power Board voltage measuring method | Revised date | | A5 |



Check the DC 24V, 12V, 3.5V.

| 24 Pin (Power Board ↔ Main Board) | | | |
|---|---|---|---|
| SMAW200-H24S | | | |
| 1 | Power on | 2 | Inverter On/off |
| 3 | 3.5V | 4 | PWM Dim #1 |
| 5 | 3.5V | 6 | PWM Dim #2 |
| 7 | GND | 8 | GND |
| 9 | 24V | 10 | 24V |
| 11 | GND | 12 | GND |
| 13 | 12V | 14 | 12V |
| 15 | 12V | 16 | 24V |
| 17 | GND | 18 | GND |
| 19 | GND | 20 | GND |
| 21 | GND | 22 | L/DIMO_VS |
| 23 | L/DIM0_MOSI | 24 | L/DIM0_SCLK |

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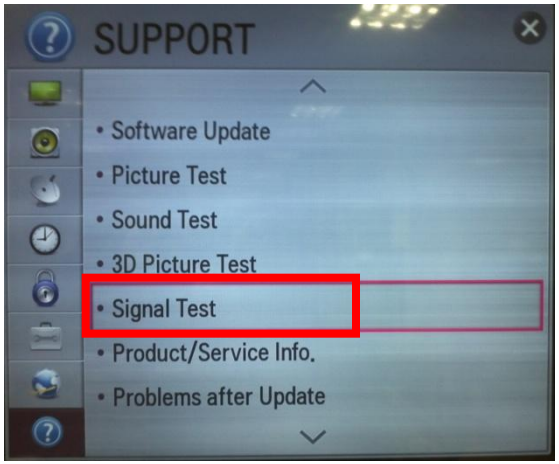
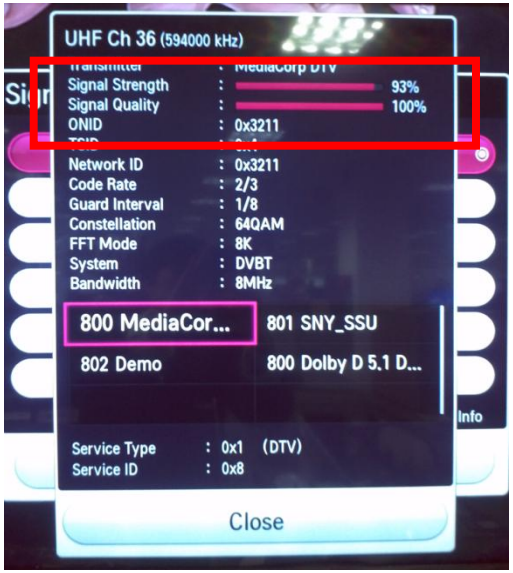
<ALL MODELS>




MENU → support → signal test
→ select channel




When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)

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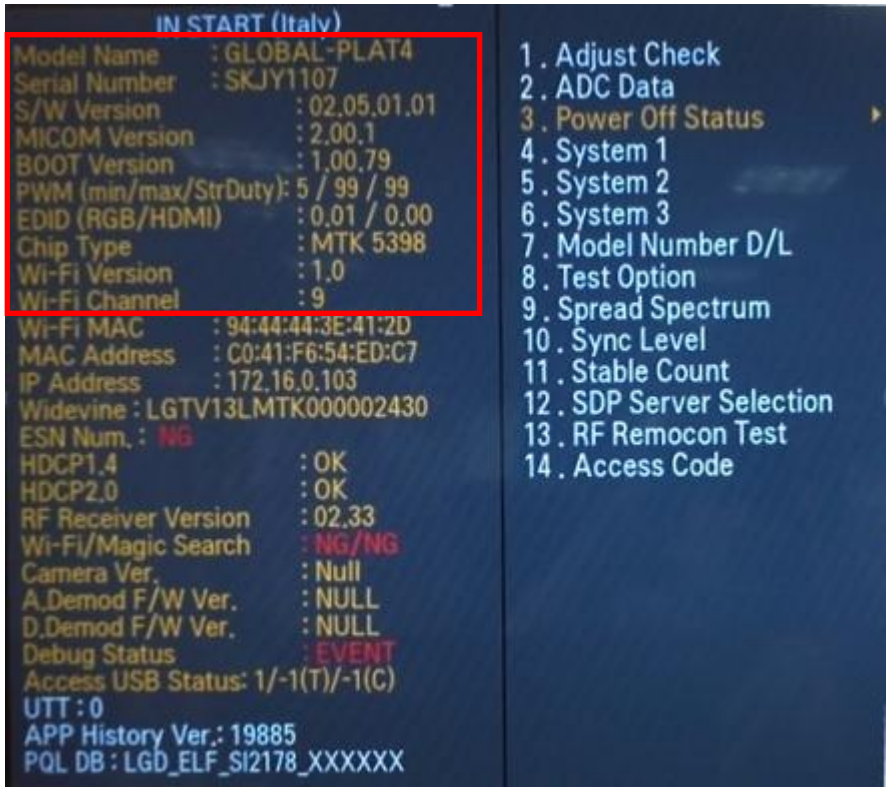
| LCD TV | Error symptom | A. Video error_Video error, video lag/stop | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | LCD-TV Version checking method | Revised date | | A7 |

<ALL MODELS>

## 1. Checking method for remote controller for adjustment

**Version**


IN START (Italy)
Model Name : GLOBAL-PLAT4
Serial Number : SKJY1107
S/W Version : 02.05.01.01
MICOM Version : 2.00.1
BOOT Version : 1.00.79
PWM (min/max/StrDuty): 5 / 99 / 99
EDID (RGB/HDMI) : 0.01 / 0.00
Chip Type : MTK 5398
Wi-Fi Version : 1.0
Wi-Fi Channel : 9
Wi-Fi MAC : 94:44:44:3E:41:2D
MAC Address : C0:41:F6:54:ED:C7
IP Address : 172.16.0.103
Widevine : LGTV13LMTK000002430
ESN Num. : NG
HDCP1.4 : OK
HDCP2.0 : OK
RF Receiver Version : 02.33
Wi-Fi/Magic Search : NG/NG
Camera Ver. : Null
A.Demod F/W Ver. : NULL
D.Demod F/W Ver. : NULL
Debug Status : EVENT
Access USB Status: 1/-1(T)/-1(C)
UTT : 0
APP History Ver.: 19885
PQL DB : LGD_ELF_SI2178_XXXXXX
1 . Adjust Check
2 . ADC Data
3 . Power Off Status
4 . System 1
5 . System 2
6 . System 3
7 . Model Number D/L
8 . Test Option
9 . Spread Spectrum
10 . Sync Level
11 . Stable Count
12 . SDP Server Selection
13 . RF Remocon Test
14 . Access Code

Press the IN-START with the remote controller for adjustment

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| LCD TV | Error symptom | A. Video error _Vertical/Horizontal bar, residual image, light spot | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | LCD TV connection diagram (1) | Revised date | | A8 |

<ALL MODELS>

**As the part connecting to the external input, check the screen condition by signal**

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| LCD TV | Error symptom | A. Video error_Video error, video lag/stop | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | TUNER checking part | Revised date | | A9 |

<ALL MODELS>

Checking method:
1. Check the signal strength or check whether the screen is normal when the external device is connected.
2. After measuring each voltage from power supply, finally replace the MAIN BOARD.

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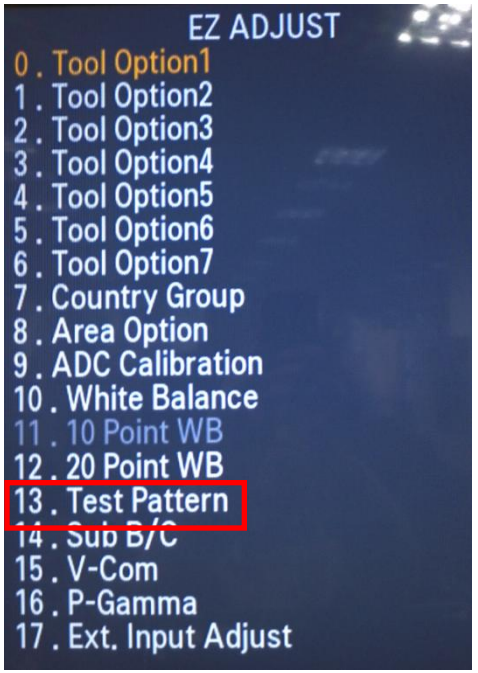

You can view 6 types of patterns using the ADJ Key

Checking item : 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR,SCAN BAR..)
4.Video error (Classification of MODULE or Main-B/D!)


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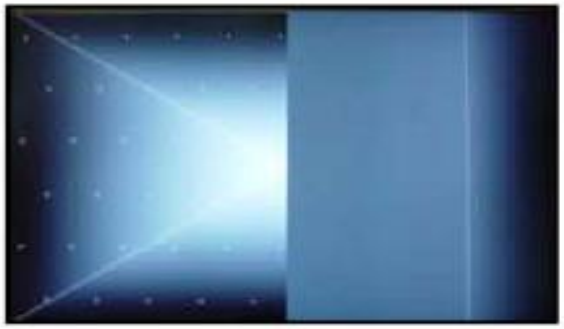
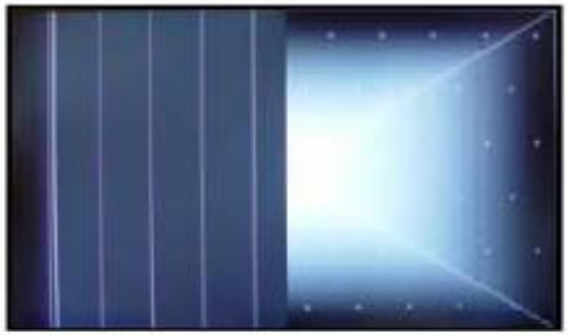
# Appendix : Exchange EPI Cable or Main B/D (1)

Solder defect, CNT Broken

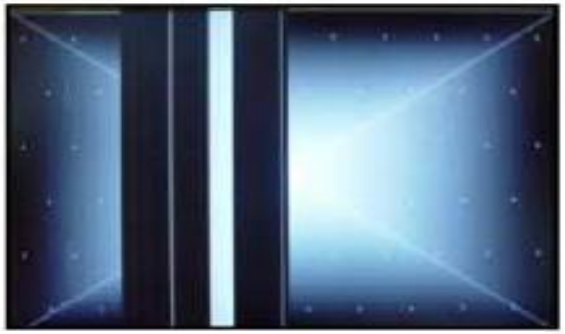


Solder defect, CNT Broken



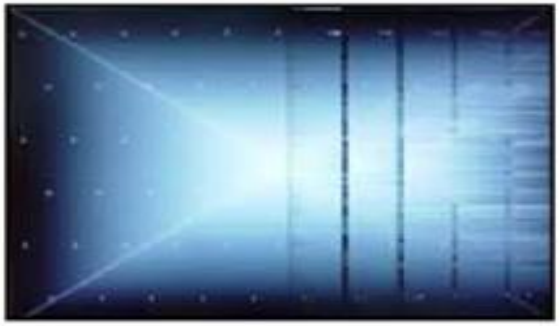
Solder defect, CNT Broken

Solder defect, CNT Broken



Solder defect, CNT Broken

Abnormal Power Section



Solder defect, Short/Crack

Abnormal Power Section

Solder defect, Short/Crack

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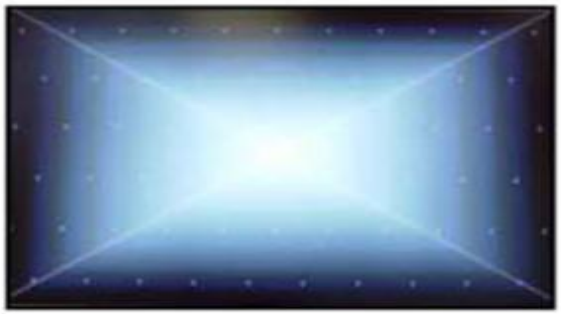
# Appendix : Exchange EPI Cable or Main B/D (2)



Abnormal Power Section

Abnormal Power Section

Solder defect, Short/Crack

Solder defect, Short/Crack

Fuse Open, Abnormal power section

Abnormal Display

GRADATION

Noise

GRADATION

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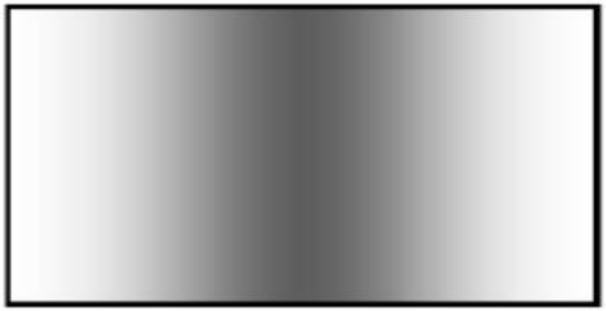
# Appendix : Exchange LPB(LED driver)

No Light

Dim Light

Dim Light



Dim Light

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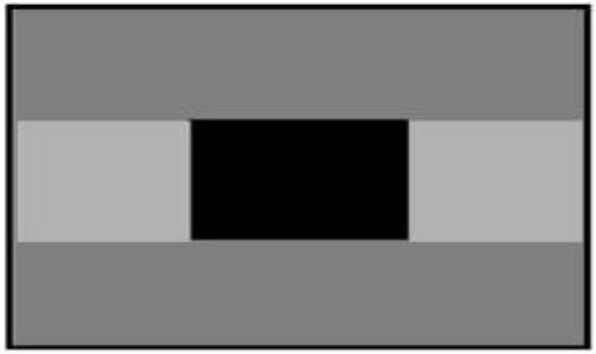
# Appendix : Exchange the Module (1)

Panel Mura, Light leakage

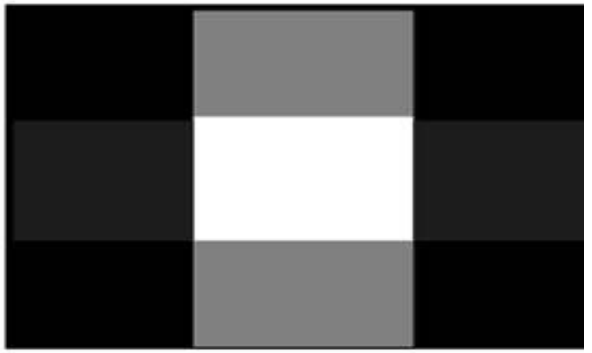
Panel Mura, Light leakage

Press damage



Crosstalk

Press damage



Crosstalk

Press damage

**Un-repairable Cases**

**In this case please exchange the module.**

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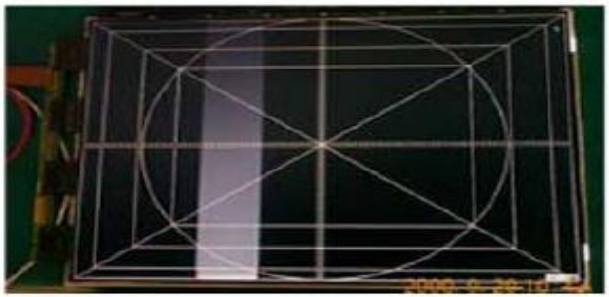
# Appendix : Exchange the Module (2)



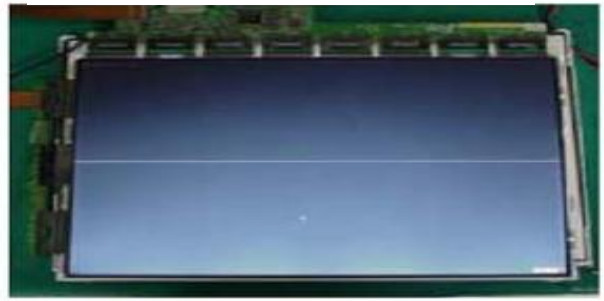
Vertical Block
Source TAB IC Defect

Vertical Line
Source TAB IC Defect

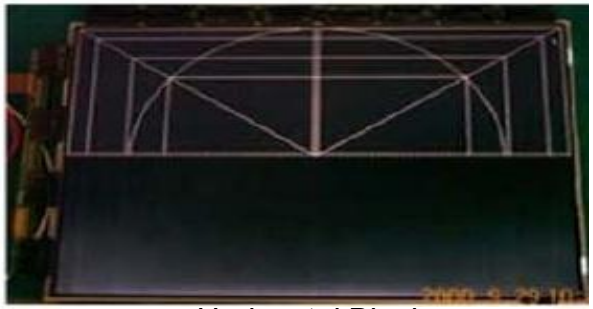
Vertical Block
Source TAB IC Defect

Horizontal Block
Gate TAB IC Defect

Horizontal Block
Gate TAB IC Defect



Horizontal line
Gate TAB IC Defect



Horizontal Block
Gate TAB IC Defect

**Un-repairable Cases**

**In this case please exchange the module.**

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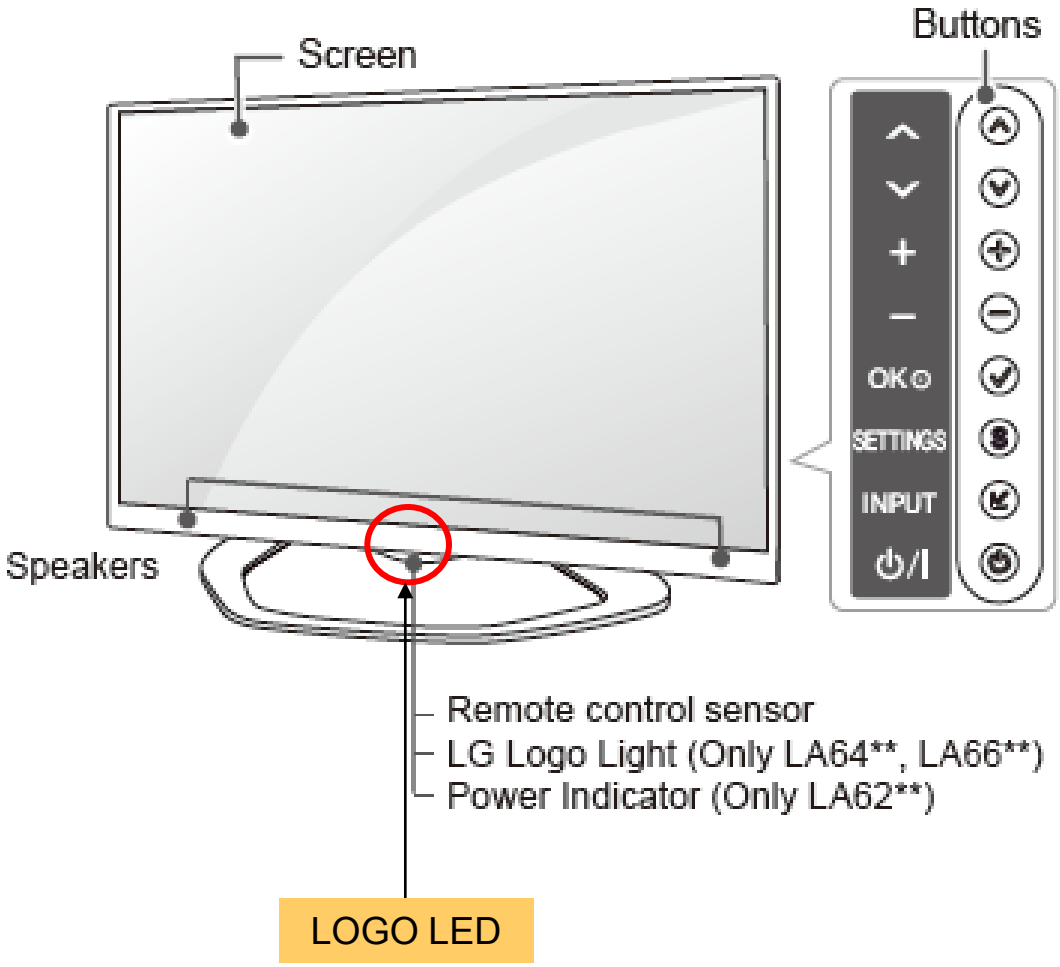


You can set the LG Logo Light to on or off by selecting OPTION in the main menus.

Front LOGO LED control in the status of ST-BY Condition:
Menu → Option → LG Logo Light → Brightness(OFF,LOW,MIDDLE,HIGH)

Front LOGO LED control in the status of Power On Condition:
Menu → Option → LG Logo Light → Duration(off, off after10min)

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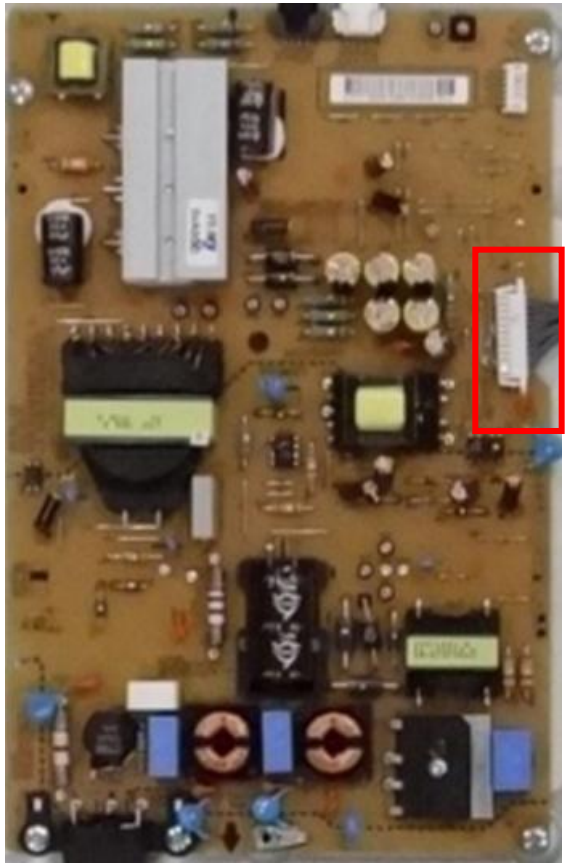
| LCD TV | Error symptom | B. Power error _No power | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Check power input voltage and ST-BY 3.5V | Revised date | | A18 |

For ’10 models, there is no voltage out for st-by purpose.
When st-by, only 3.5V is normally on.



Check the DC 24V, 12V, 3.5V.

| 24 Pin (Power Board ↔ Main Board) | | | |
|---|---|---|---|
| SMAW200-H24S | | | |
| 1 | Power on | 2 | Inverter On/off |
| 3 | 3.5V | 4 | PWM Dim #1 |
| 5 | 3.5V | 6 | PWM Dim #2 |
| 7 | GND | 8 | GND |
| 9 | 24V | 10 | 24V |
| 11 | GND | 12 | GND |
| 13 | 12V | 14 | 12V |
| 15 | 12V | 16 | 24V |
| 17 | GND | 18 | GND |
| 19 | GND | 20 | GND |
| 21 | GND | 22 | L/DIMO_VS |
| 23 | L/DIM0_MOSI | 24 | L/DIM0_SCLK |

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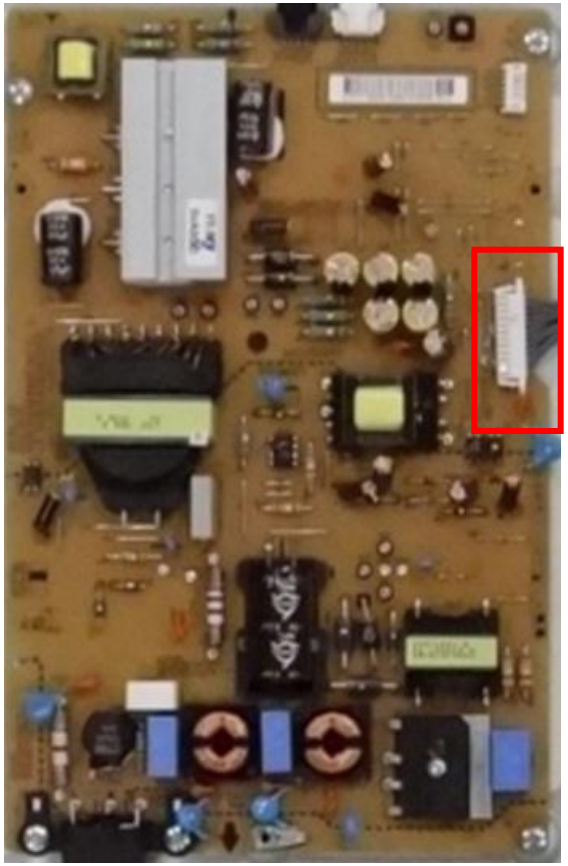
| LCD TV | Error symptom | B. Power error _No power | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Checking method when power is ON | Revised date | | A19 |



Check “power on” pin is high

| 24 Pin (Power Board ↔ Main Board) | | | |
|---|---|---|---|
| SMAW200-H24S | | | |
| 1 | Power on | 2 | Inverter On/off |
| 3 | 3.5V | 4 | PWM Dim #1 |
| 5 | 3.5V | 6 | PWM Dim #2 |
| 7 | GND | 8 | GND |
| 9 | 24V | 10 | 24V |
| 11 | GND | 12 | GND |
| 13 | 12V | 14 | 12V |
| 15 | 12V | 16 | 24V |
| 17 | GND | 18 | GND |
| 19 | GND | 20 | GND |
| 21 | GND | 22 | L/DIMO_VS |
| 23 | L/DIM0_MOSI | 24 | L/DIM0_SCLK |

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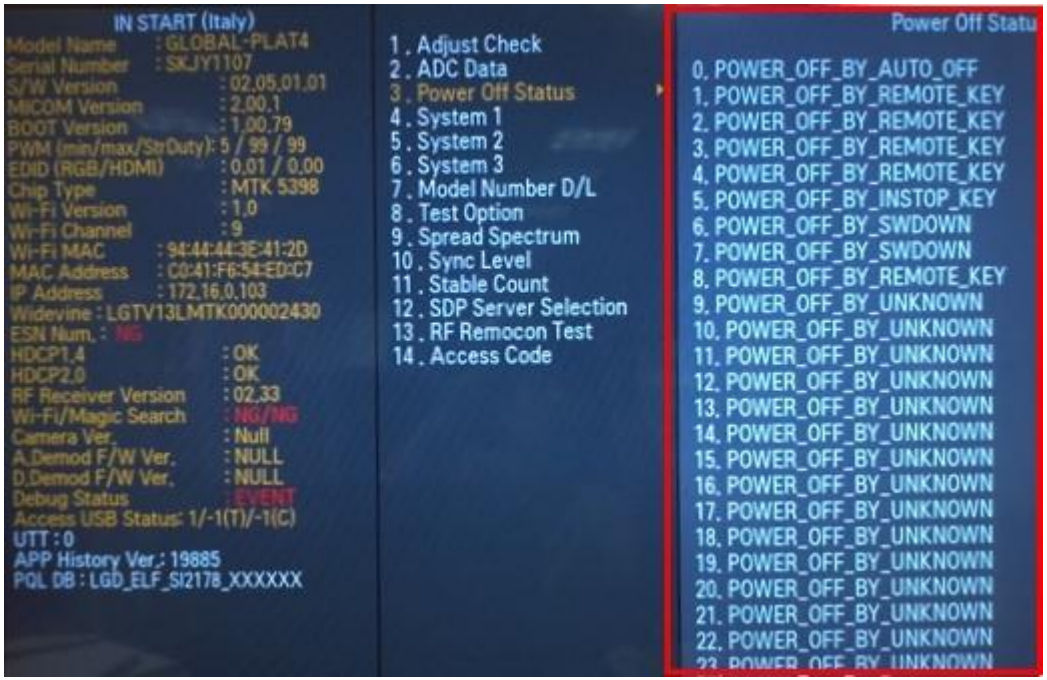
| LCD TV | Error symptom | B. Power error _Off when on, off whiling viewing | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | POWER OFF MODE checking method | Revised date | | A22 |

<ALL MODELS>




Entry method

1. Press the IN-START button of the remote controller for adjustment

2. Check the entry into adjustment item 3

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| LCD TV | Error symptom | C. Audio error_No audio/Normal video | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Checking method in menu when there is no audio | Revised date | | A24 |

<ALL MODELS>

## Checking method

1. Press the MENU button on the remote controller
2. Select the SOUND function of the Menu
3. Change TV Sound Out to TV Speaker

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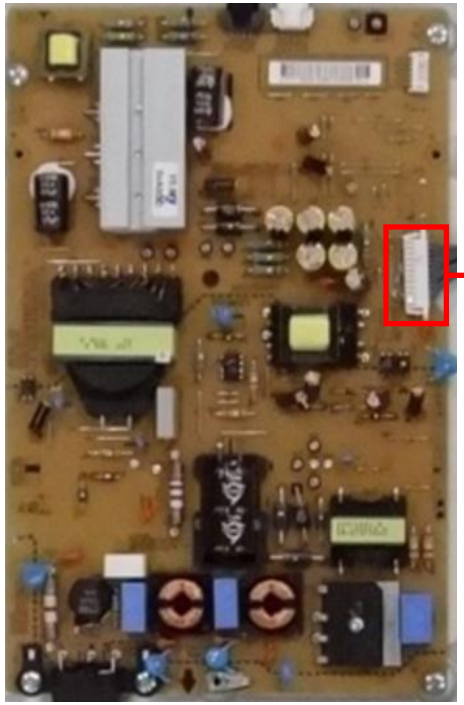
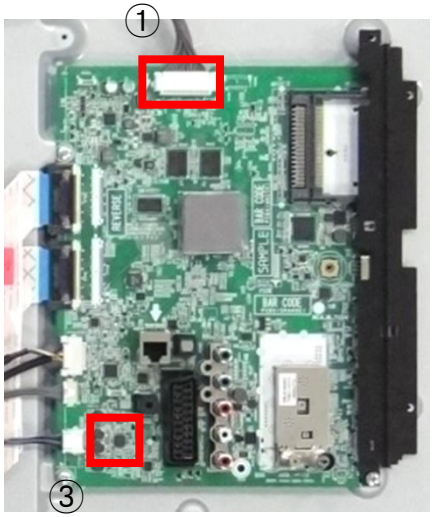
<ALL MODELS>




| 24 Pin (Power Board ↔ Main Board) | | | |
|---|---|---|---|
| SMAW200-H24S | | | |
| 1 | Power on | 2 | Inverter On/off |
| 3 | 3.5V | 4 | PWM Dim #1 |
| 5 | 3.5V | 6 | PWM Dim #2 |
| 7 ② | GND | 8 | GND |
| 9 | 24V | 10 | 24V |
| 11 | GND | 12 | GND |
| 13 | 12V | 14 | 12V |
| 15 | 12V | 16 | 24V |
| 17 | GND | 18 | GND |
| 19 | GND | 20 | GND |
| 21 | GND | 22 | L/DIMO_VS |
| 23 | L/DIM0_MOSI | 24 | L/DIM0_SCLK |




**Checking order when there is no audio**

① Check the contact condition of or 24V connector of Main Board

② Measure the 24V input voltage supplied from Power Board
(If there is no input voltage, remove and check the connector)

③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.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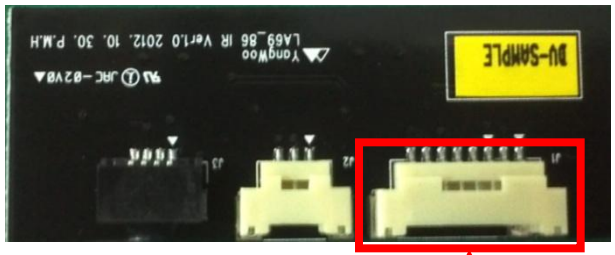
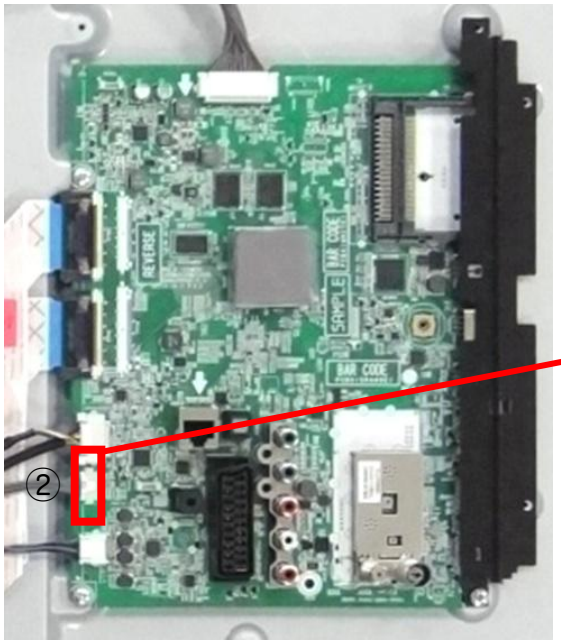
| LCD TV | Error symptom | D. Function error_ No response in remote controller, key error | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Remote controller operation checking method | Revised date | | A27 |

<ALL MODELS>




①



②

| P4101 | |
|---|---|
| 1 | GND |
| 2 | KEY1 |
| 3 | KEY2 |
| ③ 4 | +3.5V_ST |
| 5 | GND |
| 6 | LOGO/LED_R |
| ④ 7 | IR |
| 8 | GND |

Checking order

1, 2. Check IR cable condition between IR & Main board.
3. Check the st-by 3.5V on the terminal 4.
4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.

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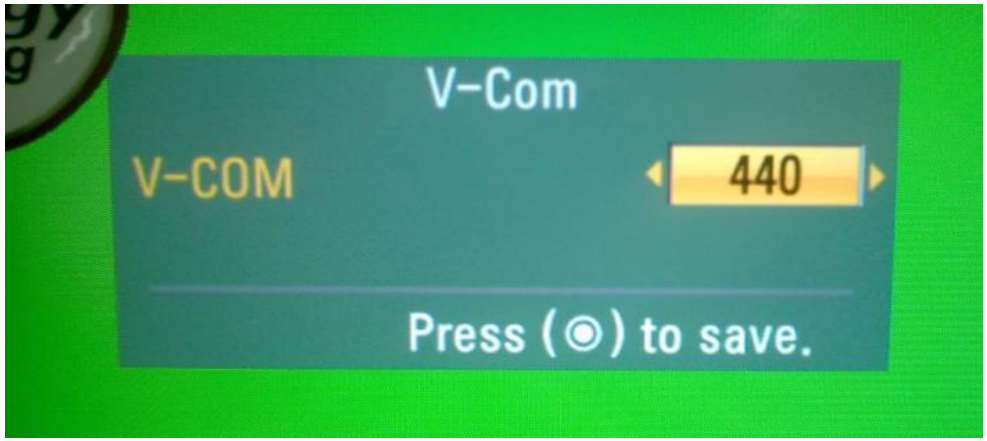
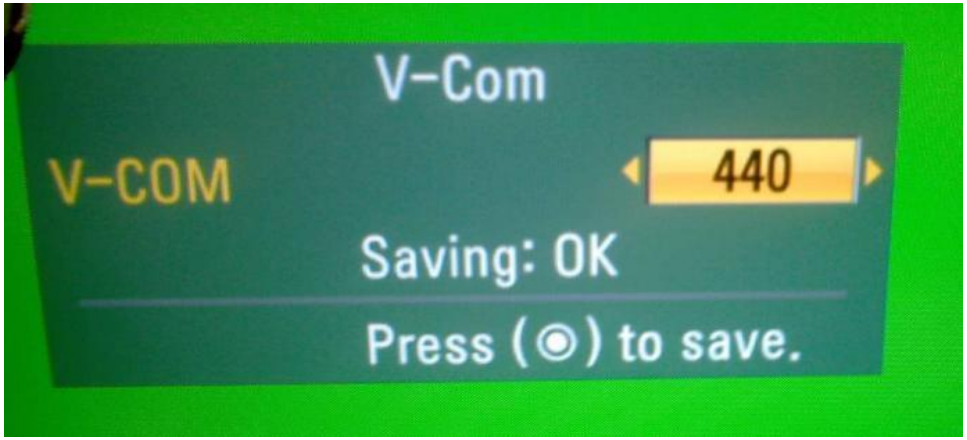
| LCD TV | Error symptom | D. VCOM Adjustment | Established date | 2012. 12 .06 | |
|---|---|---|---|---|---|
| | Content | Sequence of the Vcom adjustment | Revised date | | A28 |

## 1. Case
■ LCD module change
■ T-Con board change

## 2. Equipment
■ Service Remote controller

## 3. Adjust sequence
■ Press the ‘adj’ key
■ select V-COM
■ As pushing the right or the left button on the remote controller, And find the V-COM value Which is no or minimized the Flicker.
**(If there is no flicker at default value, Press the exit key and finish the VCOM adjustment.)**
■ Push the OK key to store the value. Then the message “Saving OK” is pop.
■ Press the exit key to finish V-COM adjustment.

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